THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1685.] LONDON, AUGUST 27, 1895. [47TH YEAR. PRICE 6d.

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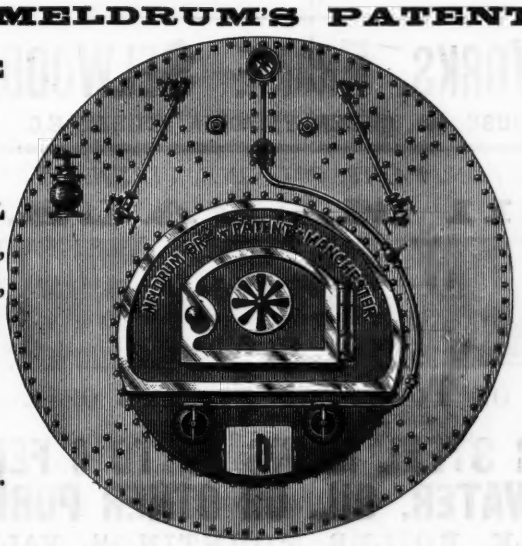

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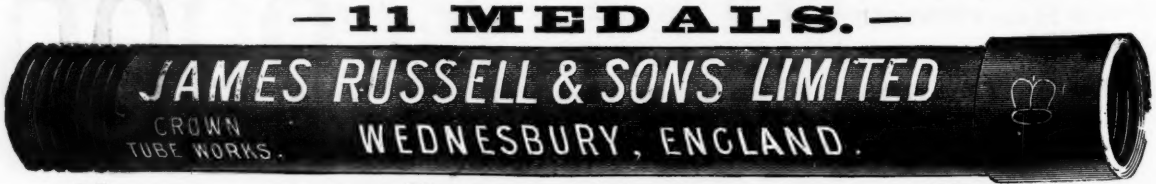

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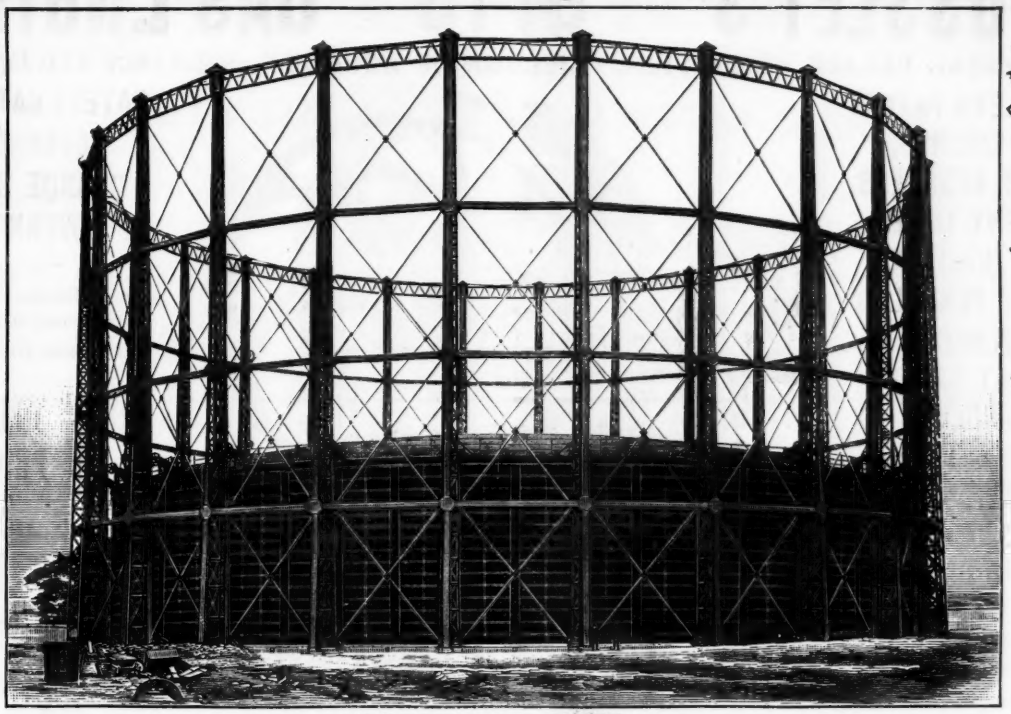

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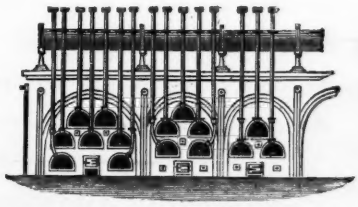

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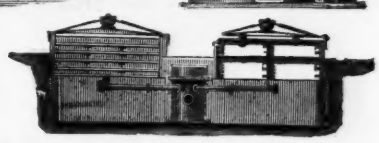

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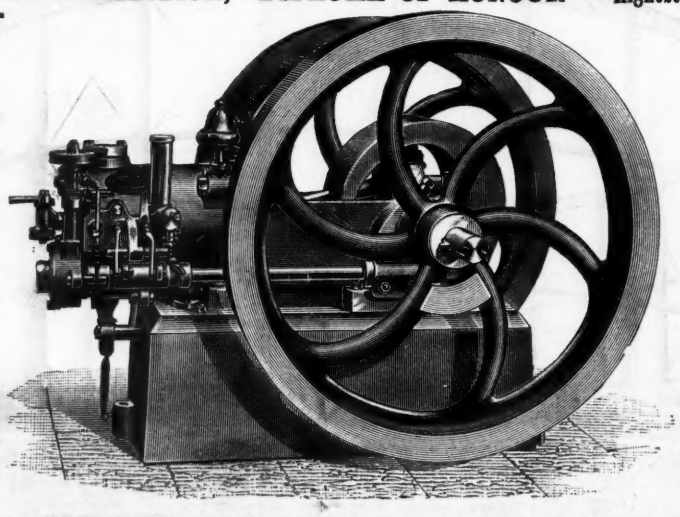

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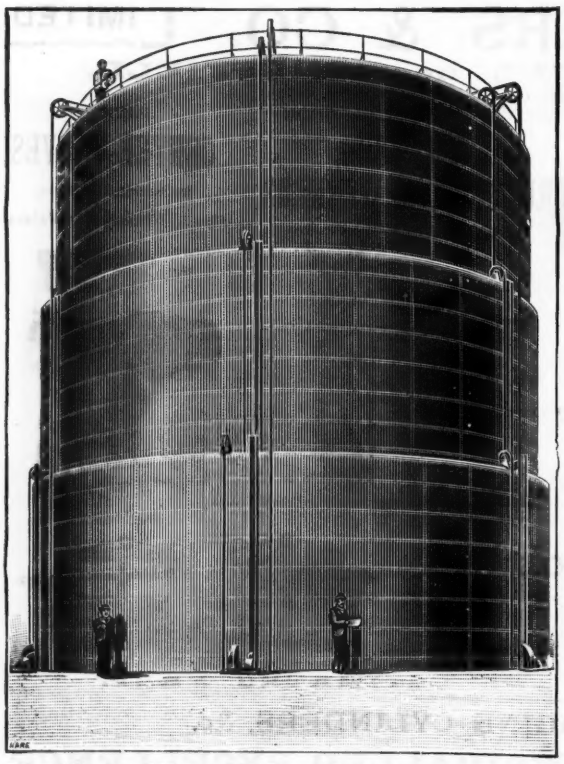

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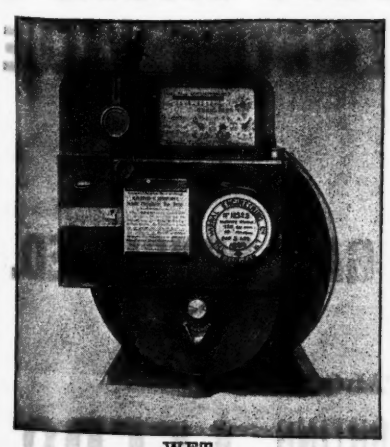

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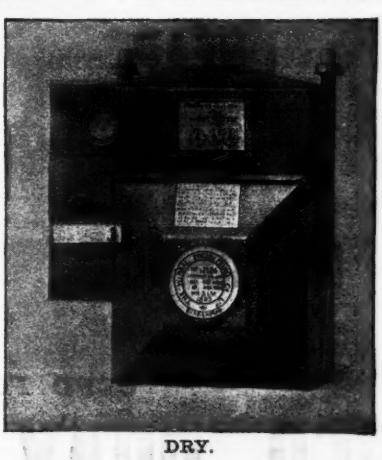

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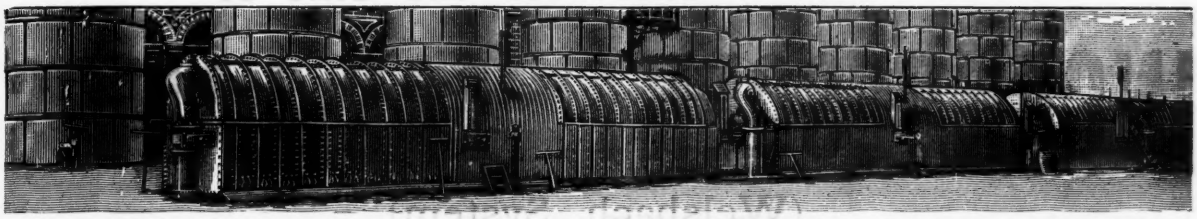

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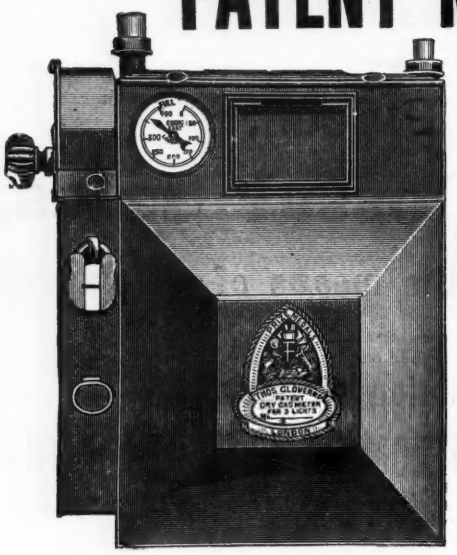

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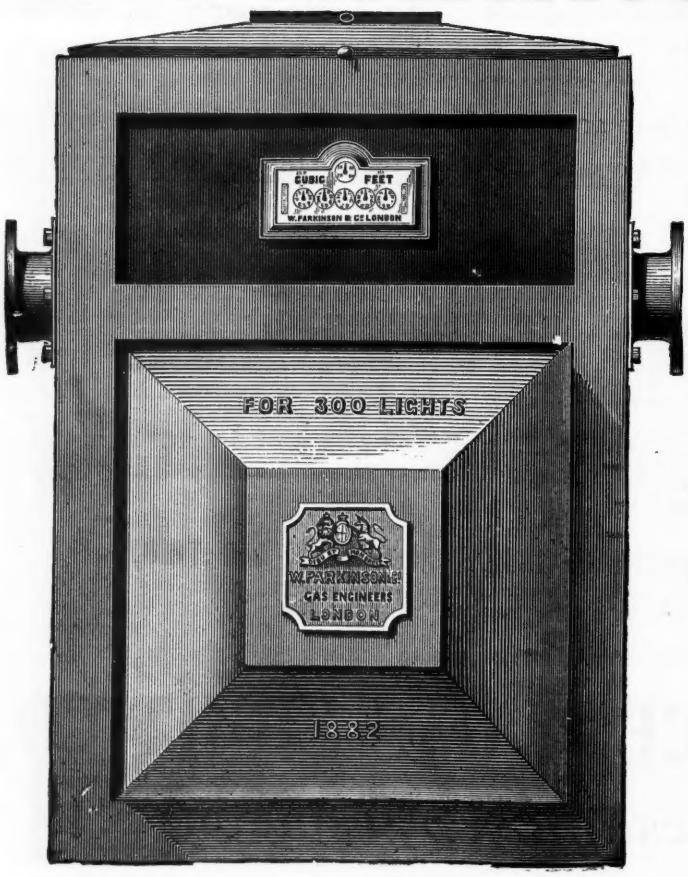

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[See also Advt., p. 464.

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TO CORRESPONDENTS.

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EDITORIAL NOTES.

One or Two South Metropolitan Points.

IN the course of a week or two, when current journalistic criticism of the workman-director scheme to be submitted to Parliament by the South Metropolitan Gas Company shall have had its say upon the idea, we shall devote some space to a discussion of such of the more noteworthy of these *a priori* criticisms as may appear to call for particular examination. Whenever this is done, our readers may rely upon our not passing over or minimizing any seriously hostile opinions that may have been put upon record respecting the proposal, from whatsoever source arising. But we shall reserve the liberty of disregarding all comments that seem to spring from mere individual prejudice or fancy. Difficult as some people find it to comprehend the fact, there is really nobody of so much importance in the world as to be able to settle an economical problem by merely declaring that he "does not like" any particular solution that may be offered by somebody else. Mr. Podsnap, we know, had a trick of ignoring social problems which were calculated to disturb his complacency. But, unfortunately, this short and easy way of treating the realities of life is only possible for people who like to dwell in a "Fool's Paradise." In effect, the gentleman who thinks he can dispose of a social or industrial question with sole reference to his own predilections in the matter, is a near relative of the immortal Podsnap, albeit he may not suspect the existence of the relationship.

Meanwhile, in order to prevent the growth of misunderstanding, it is desirable that the character of the vote at the recent South Metropolitan meeting should be recognized. It was, as the Board by the reference to the subject in the report clearly indicated that it would be, merely an expression of opinion on the part of the proprietors. The meeting in question was not competent to settle the matter out of hand; and the real executive order in this regard can only be issued by the Wharncliffe meeting to which the new Bill will have to be submitted in due course. This being so, all talk about the way in which the subject was laid before the late meeting is irrelevant to the main issue. It would have been impossible, in the circumstances, for the meeting to have been allowed to pass without the subject having been mentioned at all; and it was proper that this should be done with the utmost publicity, by a special reference in the report. This seems perfectly clear; and the question whether the matter was rightly deal with, by being included in the motion for the adoption of the report and accounts, therefore only possesses academic interest. The main thing was that each proprietor was warned beforehand that the subject would be brought forward, so that everybody was given an opportunity of speaking his mind upon it. There will be another chance of the same kind, or even better, at the forthcoming Wharncliffe meeting, which may or may not have a different result from the last meeting.

It will be as well on the present occasion to devote some little attention to the most serious point urged by Mr. John Ewart against Mr. Livesey's proposal—that the employees mainly affected by it had not given any indication of interest in the idea of a special representation, whence it might be inferred that they do not want it, would not be disposed to take advantage of it if they had it, and would not miss it if it were to be withheld altogether. Several newspapers, with that curious blindness to historical illustrations which is one of the weaknesses of the hurried journalistic writing of the day, have repeated this point, and admitted its gravity as making against the expediency of Mr. Livesey's scheme. The truth is quite the contrary. To cite only one illustration in support of this view, it may be assumed that nobody nowadays will seriously argue that the parliamentary representation of the people of this country is unnecessary, or that, on the whole, the system has not justified its originators. Yet it lies on the surface of the history of the British nation that in the early days of the institution of Parliament the constituencies had the greatest reluctance to send representatives to Westminster. Over and over again, cities and boroughs petitioned to be excused from this obligation; duly elected members of Parliament shirked their duty as far as they could; and it was only the persistence of the Crown, in forcing the people to share the responsibilities of government, that eventually made the system part and parcel of the national life. Of

course, we do not here suggest that Mr. Livesey's workman director scheme is on "all fours" with the invention of the parliamentary system, but only to show that the mere fact of any proposal in government being apparently uncalled for, is no argument at all against its intrinsic value. Indeed, as we have remarked on a former occasion, when discussing the same subject, there is all the difference in the world between an insurrectionary demand for something preferred by an order of the community which has it not, and the offer of a thing from above by those who really do possess it. To wait until it is demanded, perhaps with threats, before granting a concession to the popular view of the necessities of a situation, is to relinquish leadership into the least experienced hands. The most fruitful reforms, like that of the institution of Parliament, are those which have come from above, and have even been forced upon indifferent or unwilling recipients. Of course, the argument must not be pressed too far. But within the proper limits it is good and helpful; and here, at all events, we propose to leave it for the present.

The Gas Affairs of Liverpool—The Forthcoming Meeting of the Institution of Gas Engineers.

THE affairs of the Liverpool United Gas Company are generally worthy of sympathetic attention on the part of our readers; and particular notice may be directed to them now in view of the pending visit of the Incorporated Institution of Gas Engineers to the city. The Directors are able to recommend full dividends, and to make a further reduction in the price of gas as from the end of the last quarter. The increased use of gas due to the introduction of automatic prepayment meters is one of the features of current interest in the development of the Liverpool gas undertaking; and another is the experience of the Company in respect of the introduction on a large scale of carburetted water gas. From certain remarks by the Chairman, Mr. W. E. Lawrence, at the recent annual general meeting of the Company, it may be gathered that the distribution of the new gas has not been without some little passing inconvenience to a few of the consumers; but this seems now to have been overcome. It has been a question of burners, in connection with the specific gravity of the gas supplied; and it appears that the Company have been constrained to change the consumers' burners in some cases. A little more detailed information upon this head would be welcome; and it may perhaps be forthcoming in due time.

Another subject that is just now engaging the attention of the Directors of the Liverpool Company is that of the most economical quality of gas for the supply of the city. At present, the Liverpool gas is the richest sent out by any gas undertaking south of the Tweed; and it says much for the common sense of the Corporation that they are beginning to ask themselves and the Company whether the nominal quality is really worth the money that has to be charged for it. Wherever such a question is raised, it must be a most serious one for all parties to its solution; and this is especially the case in Liverpool, by reason of the relations subsisting between the Corporation and the Gas Company. It has long been a commonplace of municipal politics in Liverpool to abuse the Company and the Directors and all their works; and only the other day the Chairman of the Lighting Committee of the Corporation went out of his way to accuse the Company of paralyzing the industry of the city. This was, of course, mere "clap-trap;" and no doubt it was vented for a special object. But the very fact that this kind of talk "goes down" with the people of Liverpool shows how careful the Company must be to make sure of their ground when they meet their habitual detractors in a discussion upon a matter of vital importance to the undertaking. The eyes of the technical world, to use a familiar locution, will be upon the Company's Engineer, Mr. W. King, and his Board in regard to this question of illuminating power; and it is not too much to aver in this connection that, whenever Liverpool makes up its mind upon this particular subject, the gas engineers of the rest of the country will pay the closest possible attention to the favoured solution.

Altogether, therefore, it will be perceived that there is quite enough in the actual condition of the Company, and the circumstances of the local gas supply, to make it worth while for a goodly number of the members of the Institution of Gas Engineers to visit Liverpool this autumn, for the purpose of procuring information respecting these important matters at first hand. They may depend upon receiving a hearty welcome; and, whatever may be their individual and collective impressions respecting the passing vicissitudes and experiences of the Company, they will have ample reason for recognizing, in the whole administration of this great undertaking, the guidance of a high and worthy spirit striving after its traditional ideals of rectitude and devotion to duty, undismayed by carpings and cavillings of ephemeral animosities.

Some Gas Companies' Results.

THE gas companies' accounts which we are now publishing week after week enable those who are interested in gas lighting to follow the fortunes of the industry as realized in all parts of the country. The Crystal Palace District Gas Company have experienced a remarkably increased demand for gas, which has enabled the Board to meet the less favourable conditions of trade created by the depreciation in the value of residuals. According to the interesting speech of the Chairman, Mr. George Livesey, at the meeting of the Company last Friday, the consumption of gas in the Crystal Palace district has grown during the last ten years by more than 60 per cent. Considering that this Company was originally founded to supply the Crystal Palace itself with a means of lighting which during the period in question has been largely supplanted by another system, and also considering that an Electric Lighting Company has for some years past been industriously endeavouring to convert the shopkeepers and private residents in the neighbourhood to a sense of the inferiority of gas lighting, this continued success of the Crystal Palace District Gas Company must be regarded as grateful and comforting to the friends of the industry at large. Writers in electrical journals might also be advised to hang up their prophets' mantles, which they don when predicting the imminent extinction of the gas industry, and apply themselves to the study of the facts supplied in this Crystal Palace record. Municipalities owning gas-works, moreover, would do well to ponder the Chairman's statement that this particular Company have reduced the price of gas 33 times in 30 years, and raised it only once.

The record of the Provincial Gas Companies is pretty much of the same character. Everywhere there has been an increased demand for gas, the profit from which has, to some extent, been prejudicially affected by the low value of residuals. So far as coke is concerned, this effect is naturally due to the corresponding cheapness of coal, and also to the circumstance that the absorptive power of a community for coke does not always increase equally with a heightened demand for gas. With regard to sulphate of ammonia, however, it is impossible to avoid the suspicion that the market for this residual is at present kept in an unhealthy condition through the mistaken policy of the largest producers. Most of the gas undertakings of the country confess to having incurred a good deal of extra expenditure in connection with the severe weather of last winter; so that this exceptional season, while showing gas to be more than ever a necessary of life for town populations, did not bring a correspondingly enlarged amount of "grist to the mill" of the suppliers. Our electrical friends may be recommended to examine the record of the Colchester Gas Company in the light of the experiences of the owners of the local electric supply company.

The Enemies of Free Trade.

THE truism about the tendency of Time to revenge itself upon human inventions, was borne out once more in connection with the proceedings of the recent annual general meeting of the members of the Cobden Club, when Lord Farrer delivered a speech which was, on the whole, both interesting and instructive. Though professedly non-political, this organization for the advancement of the economic truth according to Cobden is traditionally in accord with Liberalism; while its spokesmen habitually regard Conservatism as "suspect" of sympathy with the Protectionist heresy. Of late years, however, new dividing-lines have declared themselves among our political partisans of different brands; and accordingly Lord Farrer now finds the greatest danger to the prospects of Free Trade to lie not in Tory reactionism, but in Trade Union tyranny. In the time of Cobden, the idea that the British workman could be anything but a Free Trader would have seemed monstrous. But this was because he was never regarded by home political economists otherwise than as a consumer.

The Cobdenite view of the needs of the British workman was that he ought to have the means of subsistence freed from all artificial burdens of a fiscal character; and in furtherance of this idea, the home producer of corn was deprived of protection, and the great watchword of a "Free Breakfast Table" became the distinguishing cry of the Liberal party. In course of time, the British workman developed characters which those of his political leaders who had fought the battle of Free Trade in his name never expected of the genus. He took to considering himself in the light of a producer—having got pretty much everything he could wish for as a potential consumer; and in so doing he betrayed an ungrateful forgetfulness of the late Mr. Cobden and his teaching. Those of him who became Trade Unionists under the benevolent regard of party politicians ready to recognize in every popular organization another agency for manipulating votes, very speedily manifested a weakness for drawing their economic instruction from German or American, instead of from orthodox British, sources. This is horrifying to the true Cobdenite; and accordingly we find Lord Farrer expostulating against the tendency of Trade Unions to "exercise "a tyranny, and endeavour to control all the means of "production." If this tendency were to join the constant tendency of capitalist producers to try and get protection for themselves, there would be no knowing what mischief might ensue. Recent events, however, have shown Lord Farrer that this danger has been much exaggerated. He believed that the workmen of England detested tyranny of all kinds, whether exercised by capitalist producers or Trade Union leaders; and when the latter, at the Norwich Congress, proposed resolutions which were contrary to the common sense of the country and of the freedom of employer and workman, those leaders lost their importance and their power. Quite so. But it needed a General Election, to which Lord Farrer did not allude, to demonstrate the fact. Until this mobilization of the political power of the country showed how matters actually lay, the Trade Union leaders referred to by Lord Farrer went on "leading" in their own vainglorious style; hectoring Governments, and soothed by the adulation of servile politicians and the music of their "Press Bands." Then came the election; and these same leaders were discovered to have no following. Never was there a more signal, or more unexpected, collapse of a supposed "popular" cause. Greater even than the discomfiture of the Trade Union leaders was that of the party politicians who, to please them, had surrendered those principles of individual liberty for which the true leaders of the people of England have always contended, and found in the hour of trial that they had made the worst of bad bargains. So perish all the enemies of Liberty.

WATER AND SANITARY AFFAIRS.

In referring to the present conduct of the *Daily Chronicle* on the subject of the East London Water Supply, we hardly know how to restrain our remarks within the ordinary limits of journalistic courtesy. Our contemporary may see fit to ignore the remonstrances in which we have sought to substitute truth for error and misrepresentation; but we must trust that the great majority who read our columns, whether connected with water companies or not, must acknowledge that while the *Chronicle* has pre-eminence in the language of abuse, we have the merit of relying upon facts. No doubt a weak cause demands strong language; but English journalism is generally marked by some sense of justice, and imposes some limit on the exercise of prejudice and ill-will. We can quite understand that the *Chronicle* has a cause to serve, and will fight to the death in its defence; yet it is possible to fight fair, and to conduct the warfare on civilized principles. But we begin to despair of the *Chronicle*. We demurred last week to its designation of the President of the Local Government Board as "the official apologist of that arch-sinner, the "East London Water Company;" and we at the same time protested against its description of Mr. Chaplin as a man who knew and cared "so little" with respect to the vast interests of London administration. We gave a good and sufficient reason for our protest. But last Friday the *Chronicle* really excelled its former self. A meeting of Vestry delegates held on the previous day proposed that the Local Government Board should order a full and complete inquiry into the cause of the deficient supply of water in the East of London. If any inquiry is wanted, this would seem the best that could possibly be devised. But what says the *Chronicle?* "If this inquiry is to be pre-"sided over by Major-General Scott, who is notoriously a "friend of the water lords, or by Mr. Chaplin, who has "given himself into their hands with an artless and child-"like trust which is an admirable measure of his fitness "for high office, we do not expect that any good will come "of it." No; we are told "there is one remedy, and only "one," and that is "to rid ourselves of these 'old men "'of the sea,' and supply such necessities for ourselves." The sentence is not very clear in its grammatical construction; but what the writer means may be readily inferred. The Water Companies are to be got rid of, and London is to rely absolutely on the County Council.

While it is thus evident that every official, however high in rank, who fails to serve the purpose of the County Council and the *Chronicle*, is to be branded as betraying a public trust, there is reserved for the East London Company a catalogue of accusations and epithets such as indicate an entire absence of anything like a disposition to deal justly and fairly with the subject in hand. The "callousness," the "incompetence," the "misleading "statements," the "dishonest silences" of the Company, are described as constituting "an unpardonable offence "against the public." Farther on we read of "extra-"ordinary audacity," the "game of bluff," "incredible care-"lessness," conduct "more than a disgrace," and nothing less than "a crime," though "not punishable by the law." We are almost reminded of the "terrible curse" in one of the Ingoldsby Legends, and wonder if anybody is going to be "the worse" for it. Certainly, if the poison which pervades these remarks can be infused into the public mind, mischief will be done. The *Chronicle* is especially excited over the statements made in Parliament last Thursday evening by the President of the Local Government Board, in reply to Mr. James Stuart. Our contemporary professes to think that "certain remarkable admissions "were painfully extracted" from Mr. Chaplin by the questions thus propounded. The East London Company had declared that as the County Council would not let them have storage, they were not to blame. "Will it be believed," asks the *Chronicle*, "that it is "now confessed that this amazing Company possessed "all the while by far the largest storage of any "Company in London." This was known and believed long ago, and has been proclaimed for years in the monthly reports of Major-General Scott—that "notorious friend of the water lords." There is nothing to be "confessed," seeing that the truth has long been proclaimed from the housetops. How is it that Mr. Stuart does not make himself acquainted with the contents of General Scott's reports? "Will it be believed," we may ask, that these reports are regularly furnished by the Local Government Board to the County Council, and to all the sanitary authorities in the Metropolis? Mr. Chaplin might have added that these reports are also sent to the Editors of all the London morning papers, including the *Chronicle;* though, of course, it does not follow that everybody who receives the reports takes the trouble to read them. Mr. Stuart thought that these documents should be laid upon the table of the House. But Mr. Chaplin considered it would be sufficient if he arranged for copies to be regularly forwarded to any member who desired to have them. Mr. Stuart is now so anxious to be well informed, that he wants further particulars concerning the resources of the East London Company; and there is no doubt that he will soon obtain enough of such information, having moved for a return according to Mr. Chaplin's suggestion. As for the need of increased reservoir capacity at the East London works, some few years have elapsed since General Scott reported that the time for such enlargement was close at hand. None of the present controversy was then rife; and General Scott was scarcely thought to be a friend of the East London Company in proposing that they should proceed at an early date to augment their means of storage. But, of course, the County Council know nothing of all this.

A knot of busybodies at the East-end are trying to make themselves prominent by getting up an agitation on the subject of the water supply. Hence we read of "an "influential conference of representatives of the London "Vestries and District Boards," held in the Hackney

Town Hall last Thursday, to discuss the water question. The wisdom which—with some very slight exception—characterized this assembly may be inferred from the statement of the Chairman, implicitly accepted by the meeting, that the East London Company, in bringing forward their Bill in 1893, "forced opposition on the part of the Council, "for the simple reason that they refused to withdraw a "most obnoxious clause." The utter inaccuracy of this statement has been shown on more than one occasion, notably by a letter from Messrs. Bircham and Co., published a full fortnight before the Hackney meeting. The redoubtable Mr. Kyffin naturally took a lead at this gathering, and proposed that the County Council should be requested "to take action against the Company to compel "them to carry out their statutory obligations." The East London Company have been most anxious to do this; but if there is not sufficient water in their reservoirs, no force whatever can make up for the deficiency. The question is one of hydro-dynamics, independently of parish politics and County Council strategy. However, a deputation from five of the East London Vestries is to go up to Spring Gardens to-day, to confer with the Water Committee of the County Council. Another deputation from the same Vestries, but bound on a somewhat more sensible errand, is to wait upon the President of the Local Government Board, to ask for an inquiry. We should conclude that the Board had already inquired into the matter; and something more practical is to be found in the proceedings of the East London Company, who are busy with the enlargement of their works. In the meantime, the prospect of the supply is improving; giving the Directors hope that the present eleven hours' service throughout East London may soon be extended so as to cover the whole four-and-twenty hours. The pipes belonging to the Company were all mended or replaced early in April; and repairs to the damaged pipes of the consumers are in progress. A most conclusive report from Mr. Bryan, the Company's Engineer, disposing of Mr. Binnie's "shattered "main" theory, appeared yesterday. On the question of domestic storage, it is amusing to find a Medical Officer of Health at Bow, writing to *The Times*, denying most positively, in answer to an accusation from Mr. Crookenden, that he had "ever aided landlords in the abolition of cisterns "used only for the purpose of storage." A general disavowal similar to his own is put forward by this gentleman on behalf of the Medical Officers of Health throughout East London. There can be no question that, in respect to domestic storage, the Medical Officers at the East-end have considerably modified the objections which they formerly entertained to the use of cisterns. The virtues of the constant supply are great; but the house cistern is still a "neces- "sary evil." As we have commented on the intemperate language in which the *Daily Chronicle* has dealt with the water question, perhaps we should also express our regret that the *British Medical Journal* shows something of the same spirit, though not to the same extent. The perfectly just defence offered by the East London Company with respect to the loss of a year in the passing of their Bill, is stigmatized by this medical paper as "a very idle "and audacious excuse." Such is the invective by which it is sought to discredit an unpalatable truth. It is marvellous that so patent a fact as the opposition of the County Council to the Bill of 1893, and the avowed reason for that opposition, should ever be denied.

Prize for the Discovery of Argon.—The reports of the Committee appointed by the Smithsonian Institution to award the Hodgkins Fund prizes have been published in *Nature*. It appears that no fewer than 218 papers were submitted in competition. The first prize, $10,000, for a treatise embodying some new and important discoveries in regard to the nature or properties of atmospheric air, is awarded to Lord Rayleigh and Professor William Ramsay, of the University College, London, for the discovery of argon.

Presentation to Mr. Frank Osmond.—On Monday morning of last week, the workmen employed at the Dorchester Gas-Works presented their Manager, Mr. Frank Osmond, with a silver sugar basin, on the occasion of his approaching marriage. The presentation was made in the board-room of the Company by the Chief Clerk, Mr. W. E. Groves, who, on behalf of the men, wished Mr. Osmond happiness in the future. Mr. Osmond thanked the men for their kind expressions for his future welfare, and trusted that the same good feeling which had existed between them in the past, would be maintained. Hearty cheers were given for the Manager by the men before separating. The marriage took place last Tuesday.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 453.)

Business on the Stock Exchange was very quiet last week; and in the City generally the depopulating power of the holiday season is showing itself with considerable force. The markets thus were very inactive—even those which hitherto maintained their briskness to a fair extent. But, despite a thin attendance and restricted dealings, the general tone was good, and the tendency was decidedly firm; so that prices have not suffered in any degree. While there was less speculation, so, on the other hand, choice investment securities were in excellent demand; and among them the debenture stocks of the Water Companies were conspicuous, though the corresponding issues of gas undertakings were neglected. The condition of the Money Market remains unchanged, and without any promise of amendment. In the Gas Market, the volume of transactions was very fair indeed, considering the general slackness; and the strength of the market was generally pretty well maintained. Variations in quotations were not by any means numerous, but a few considerable strides upward were achieved, while there was only one relapse. This, however, was the leading issue. Gaslight "A" was tolerably active through the week, and the actual prices at which bargains were made showed little, if any, falling off; but the quotation was marked one point lower. Beyond a few dealings in the 10 per cent. preferences, the secured issues did not come in for any notice. There were very few dealings in South Metropolitans; but all three issues continued their upward march—the "A" making a big stride of 10. Commercials were hardly touched; but the old stock was put up a point, though no business was marked in it. The Suburban and Provincial Companies were conspicuously quiescent; and hardly one of them was noticed. There were a few dealings, at about middle figures, in the Continental undertakings; but the chief issues did not move. Cagliari rose a point. Among the rest, the only noticeable incident was a further advance in Monte Video. Business in Water stocks was very quiet indeed. The only variation was a nice rise in Grand Junction; all the rest kept very firm.

The daily operations were: Business in the Gas Market was quiet enough on Monday, and prices were not remarkable in any way. Nothing moved except Monte Video, which rose ¼. Transactions on Tuesday were a trifle better, and some smart advances were scored. South Metropolitan "A" gained 5; ditto "B" and "C," 2 each; and Monte Video, ¼. Grand Junction Water rose 2. Wednesday was active, especially for Gaslight "A." The best price of the week—294—was marked that day; but the quotation fell 1. Thursday was much quieter; but prices held up, and Commercial old rose 1. Business on Friday was about the same; and Cagliari advanced 1. Everything was very quiet on Saturday; but South Metropolitan "A" rose 5 more.

INCANDESCENT GAS-LIGHTS IN EXPOSED POSITIONS.

With the extending use of the incandescent gas-light for the purposes of lighting streets and open spaces, the question of the utility of the system for all sorts and conditions of situations will have to be considered; and therefore any evidence, experimentally derived, as to the performance of the light in uncommon positions will be welcome. For ordinary street lighting, it may be said, incandescent gas-lights have emerged from the experimental stage, and entered upon practical use. In many towns now whole streets are satisfactorily illuminated at nightfall by their means; and soon Ipswich and Winchester will be able to afford experience of general schemes of lighting by this system. It will be interesting, at the close of (say) six months' working, to receive for publication from Mr. Jolliffe and Mr. Dexter accounts of what has been accomplished by them in this new direction.

Testimony is now wanting as to the performance of the lights in elevated and exposed situations, where it may be presumed that the light would be adversely affected, and the life of the mantles diminished, by violent winds and storms. A contribution towards information of this kind has been kindly furnished by Mr. H. H. Jones, the Engineer of the Margate Gas-Works; and his carefully-kept records, dating from Jan. 22 last, cover a period which has been marked by particularly severe and boisterous weather. Taking his notes in the order in which they were supplied, the particulars first given bear upon the durability of the mantles. Zion Place was selected by the Corporation Lighting Committee as the most exposed spot in the whole town, and therefore the most suitable for testing the value of the light. On one side, it is open to the sea, and four roads converge to it. The lamp being situated in the centre, it catches the winds from all quarters. An experiment was commenced here on Jan. 22 last; the burner and mantle being fitted in an ordinary lantern, converted by the Gas Company to what was considered requisite, by putting an internal

copper cone at the top so as to check excessive "top draught." It will be remembered that the weather at the end of January was very severe; and the result was that the mantle had to be renewed on the 24th, after only two days' use. An improved ordinary 14-inch lantern was then obtained from the Incandescent Gas-Light Company; and since then there has been but little trouble. As will be seen from the following dates, each new mantle has had a prolonged existence. The second mantle, put in on Jan. 24, lasted to Feb. 8; the third, from that date to March 19; the fourth, to May 10; and the fifth is still in good order—having already been in use about 110 days. On Fort Green, eight lamps were fitted with incandescent gas-lights just before Whitsuntide. In our opinion, the test here is even more severe than in Zion Place; the lamps being erected along the promenade on the sea-front, with a large space at the back, into which open the main thoroughfares. They have therefore no protection whatever; being fully exposed to the winds from the land and gales from the sea. But with the special lanterns already referred to, notwithstanding the recent heavy storms, only five renewals have been required since the first installation of the lamps. With another lantern on Fort Paragon, similarly arranged to the one used in the first experiment in Zion Place, five mantles were destroyed in ten days; but since the lantern has been replaced by one of the improved pattern, the results have been satisfactory. The foregoing notes all refer to lamps in exposed situations; but it may be mentioned that, in an experiment in Cecil Square (a sheltered position), with an ordinary adapted lantern, four mantles have been required since Jan. 22—the last one having been fixed on May 10. Mr. Jones estimates that an average of eight mantles per annum will be quite sufficient in the exposed positions.

The type of burner used by Mr. Jones in his experiments is the "C" bye-pass, with glass bulbs and governors; the latter being set for a consumption of 4 cubic feet of gas per hour. In the case of the Cecil Square lamp, the glass bulb has not been employed; and an ordinary "C" burner, with a mica chimney, is used with the Company's own lantern, simply provided with an inner tube. Regarding the consumption of 4 cubic feet an hour, Mr. Jones does not admit that the generally quoted rate of 3 cubic feet an hour is sufficient for obtaining the best results. For the bye-pass, he finds that, for safety, the consumption must be regulated to not less than ¼ cubic foot per hour. It might, he says, be reduced a little; but, in exposed situations, the flash-light would be frequently extinguished, and be a source of much trouble to the lamplighter.

Concerning the illuminating power of the lamps, the best value is obtained with a consumption of 4 cubic feet of gas per hour, at a pressure of 10-10ths; the light afforded being about 53 candles with a new mantle. Increasing the pressure, causes a diminution of the illuminating power. Mr. Jones's experience in this respect agrees, he informs us, with the results of tests made by Mr. H. Leicester Greville, the Chemist of the Commercial Gas Company.

The burners so far adopted are fitted with the chain and ring arrangement for lighting and extinguishing. But Mr. Jones has good reason for holding a strong objection to it. He finds that playful, holiday-making youths, and others of an inquiring mind, are attracted by the chain and ring; and, by the aid of sticks, are given to testing the efficiency of the device. Burners are now being made with an ordinary T-tap underneath; and these, in his opinion, have distinct advantages.

In conclusion, it may be pointed out that one of the greatest difficulties experienced in seaside towns with incandescent lights is caused by sea fogs, which involve the frequent cleansing of the glasses; and this in turn is responsible for some of the fractured mantles.

WATER-RATES v. METER SUPPLIES.

It cannot be said that the dream of a universal water supply by meter is much nearer the point of realization than it was when, week after week, the subject was ventilated in the columns of the JOURNAL some years ago. But, none the less, the incidental discussion of the subject which took place at the last annual meeting of the American Water-Works Association—of which some account appeared in our last issue—presented many interesting, if not altogether practical, considerations. The United States afford examples both of the assessed and the meter systems under conditions as varying as the habits and characteristics of the people. But the Superintendent and Secretary of the Detroit (Mich.) Water-Works believes that a much greater uniformity could be brought about than at present exists. He frankly concedes the impossibility of absolute uniformity, though regarding an unequal system in any one community as inexcusable. "Inexcusable" seems to be too strong a word. "Unfortunate" or "regrettable" would be more apposite; for, however strong and natural the desire to make practical operations accord with theories of fitness, wise men have to realize that it cannot always be done. When a thing cannot be done, it is not correct to describe what has to be left undone as "inexcusable."

One of the speakers pointed out that a fixed schedule of water-rates, though suitable in Detroit, might not be equitable in other cities. We should be disposed to go farther, and say that what might be just and convenient in one district of Detroit (or of any other great city) might involve disastrous results from a sanitary point of view if applied in another district. For a district of warehouses, the meter system might work well; for a district of small tenements, it would, if carried out *simpliciter*, offer a check to sanitation and be productive of a marked increase in the death-rate. A large consumer, it was argued at the recent conference, should pay a lower rate than a small one. But how would that suit the views of the malcontent consumers who, in England, state their grievances to the police magistrates, or ventilate them in the columns of the daily press? Another of the speakers, who hailed from Brooklyn, did not fall in with the views of those who might be styled the representatives of Detroit, Indianapolis, and other centres. In Brooklyn, he said, the water-rate was uniform. There, one-fifth of the water-rate comes from the meter system; and the remaining four-fifths from the sugar-refineries. Clearly, then, Brooklyn cannot be quoted as an illustration of what might, and ought to, be done in cities where the conditions are very different.

So far as we in England are concerned, the question of meter *versus* rates is dormant. In all the discussions of the London County Council, in all the utterances of parliamentary orators, we find nothing which suggests that a wholesale departure can be made from the present system. The Progressives, with all their progressiveness, have not progressed as far as that. Indeed, no one who with any degree of sincerity professes to have the interests of the poor at heart, could possibly advocate a revolutionary departure which, for example, would place dwellers in the East-end of London under far unhappier conditions than those to which they have recently had to submit from causes beyond the control of the East London Water-Works Company. Nor is anyone who understands the subject at all likely to commit himself to the doubly-difficult financial problem which the purchase of the water-works would involve, if the new proprietorship were to be accompanied with a proviso that the well-considered system of rates at present in force should give place to a general system of supply by meter. The system of water supply must meet the greatest convenience of the greatest number. It must have a practical, workaday basis; and, though the method in vogue may be anomalous in some of its aspects, it is necessary to remember that anomalies frequently work well—better far than schemes which look excellent on paper but which prove to be chimerical and delusive directly it is sought to adapt them to the actual needs of the population under the complex conditions of social life.

Mr. M. S. Blaker has been appointed a Director of the Lewes Water-Works Company, in place of the late Mr. George Lenny.

A Furnace-Gas Analyzer.—Messrs. Meldrum Brothers, of Manchester, are introducing a form of analyzer for ascertaining continuously and automatically the percentage of carbon dioxide in furnace gases. The apparatus consists essentially of a delicate gas-balance. Carbon dioxide being much heavier than air, the greater the percentage of this present in the smoke, the greater the deflection of the needle of the balance. A table is provided, showing at a glance the percentage of the gas corresponding to any given deflection; and this forms a ready means of ascertaining whether the amount of air admitted to the furnaces is much in excess of what it should be.

The Late Committee on the London Water Bills.—The recent General Election has not made much change in regard to the returns from towns represented by members who constituted the Hybrid Committee on the London Water Bills in the past session; so that, should an endeavour be made next year to reappoint the Committee as nearly as possible on the old lines, there will probably be little difficulty in so doing. The Chairman (the Right Hon. D. Plunket), Sir J. Kitson, Sir H. Stafford Northcote, Mr. Baldwin, Mr. Muntz, Mr. P. Stanhope, and Mr. Briggs Priestley are all in the new Parliament; but of the other two members of the Committee—Mr. Burnie and Mr. Ainsworth—the former has had to give place to Sir J. T. Dillwyn-Llewelyn, and the latter to the Hon. H. V. Duncombe.

Visit of the Iron and Steel Institute to Tangyes' Works.—The holding of the annual meeting of the Iron and Steel Institute in Birmingham last week afforded the members an opportunity of inspecting the vast establishment owned by Tangyes Limited; and a party numbering about sixty availed themselves of it. The visitors were received and conducted over the works by the Managing-Director (Mr. G. H. Haswell), the Secretary (Mr. W. J. Parkins), and the Works Manager (Mr. W. Johnson). Every department of the famous establishment, which covers about 20 acres, and in which from 1500 to 2000 men are employed, was thrown open to inspection. In the engine-fitting shops were seen in course of construction steam-engines in great variety; while in the gas-engine department, gas-engines of all sizes—of from 1 to 146 actual, or 170 indicated horse power—were being made and tested. The alterations and improvements going on in this department of the works aroused considerable interest. The extensive shops and yards devoted to boiler-making having been inspected, the visitors passed through the smithies, where the working of various huge tools, boring and shaping immense castings for the heavy engines and machinery, was critically and appreciatively observed. Several of the large pumps, rams, and hydraulic presses were seen in construction and on trial, including pumps of the "Special" and double-ram types.

TECHNICAL RECORD.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Abstracts of the Papers.

In the JOURNAL for the 23rd ult., we gave a report of the proceedings at the annual congress of the above Society, together with a translation of the principal portions of the address of the President (M. de. Lachomette). We now notice briefly the papers presented on the occasion, abstracts of which are contained in the *Journal des Usines à Gaz*, the official organ of the Society.

The subject of condensation was dealt with in a paper by M. Godinet. The author commenced by stating that condensation should be sufficiently complete to clear the gas of any redundant naphthalene vapours, but should not be carried so far as to take out the hydrocarbons so necessary for increasing its illuminating power. Contact of the gas with the tar should be as limited as possible, as this substance has been proved incontestably to cause dissolution of the light-giving hydrocarbons. The author cited, in support of his statement, several striking examples met with by him when carrying on tar distillation; and he summed up the first part of his paper by recommending that the gas should be cooled down to a temperature equal to, or even below, that of the coldest appliance it would have to traverse in its passage to the burner. M. Godinet next took up the practical side of the question—following the gas in its progress through the various parts of the plant. He described the advantages and inconveniences attending the three systems which have been employed to prevent stopped ascension-pipes; and he expressed the opinion that the one generally adopted—viz., leaving the retort mouthpiece and the pipe open to the air—is the best. The precaution should be taken to clear the pipe at each charge. While keeping the retort at such a temperature as to work off the charge in the prescribed time, unnecessary heating of the mouthpiece and the pipe should be avoided. Whatever may be the shape of the hydraulic main, its temperature should be kept as low as possible; and it is indispensable that the gas, on leaving the dip-pipe, should pass through water and not tar. The author discussed the system of hot condensation, and expressed the opinion that the benefits attributed to it are really due to attendant causes. He questioned the necessity for the gas to travel slowly, and in large pipes, from the hydraulic main to the condenser. On the contrary, he contended that the only way of preventing contact of the gas and tar is to convey the gas quickly into powerful coolers, but of small superficial area, and to remove all condensed products as soon as possible by means of numerous syphons. M. Godinet said he was a partisan of the system of condensation employed by the Lyons Gas Company, and devised by M. de Craponne, the Company's Engineer. His condenser consists of five or more groups of four horizontal pipes, through which the gas is made to pass successively; the pipes being kept cool by water. A surface of 54 square feet is ample for cooling 35,000 cubic feet of gas in 24 hours; and the gas usually leaves the appliance at a temperature between that of the water and that of the air. The author has put up at Vichy a condenser on this system, with six groups of pipes; and he cools there, in the height of summer, with a superficial area of 646 square feet, something like 212,000 cubic feet of gas per 24 hours. The gas enters the appliance at about 122° Fahr., and sometimes leaves it at a lower temperature than that of the air. This cooler would be amply sufficient in winter for a make of from 425,000 to 530,000 cubic feet of gas. For condensation by impingement, M. Godinet favours the Pelouze and Audouin appliance for large works, and the Chevalet washer-condenser for small ones. He considers that the ordinary exhauster should be placed between the cooler and any condenser constructed on the principle of impingement; whereas the steam-jet exhauster should come after it, as the naphthalene held in suspension would be sublimated by the steam, and cause obstructions. The author concluded by reiterating his opinion, that though the system of hot and slow condensation has been much praised, the opposite plan is, if not better, at least as good, as far as the quality of the gas is concerned, and more economical as an installation.

A rather long communication on "Cyanogen in the Manufacture of Illuminating Gas" was read by M. Perthuis. He pointed out that laboratory experiments show that, in all the reactions which take place in the formation of cyanide and sulpho-cyanide of ammonium, the fixation of the nitrogen is greater in proportion to the temperature and to the slow rate at which the gas passes; also that the transformations are never complete. The same reactions go on in the retort. Carbon, carbonic oxide, bisulphide of carbon, and ammonia are acted upon by very high temperatures; but, as there is an excess of ammonia, cyanide and sulpho-cyanide of ammonium are produced, and not hydrocyanic acid. All these compounds of cyanogen pass the hydraulic main, condensers, and scrubbers, and are acted upon in the purifiers. If these cyanides, both of which are very soluble in water, do not dissolve in greater quantity, it must be attributed to the fact that the carbonic acid contained in the gas decomposes these bodies in liberating the hydro-cyanic and sulpho-cyanic acids. In the oxide of iron purifiers, reactions take place between the cyanide and sulpho-cyanide of ammonium, the hydro-sulphuric acid, the ammonia, the sulphur, and the ferrous compounds. According to M. Perthuis, these reactions are as follows: The oxide of iron, in combination with cyanide of ammonium, forms ferrous cyanide, which when exposed to the air is quickly transformed into Prussian blue, according to the following formula:—

$$9\,Fe(CN)_2 + 3\,O = Fe_2O_3 + Fe_7(CN)\,18.$$

If, however, there is an excess of cyanide of ammonium, the ferrous cyanide is transformed into ferro-cyanide, thus—

$$Fe(CN)_2 + 4\,NH_4CN = Fe(CN)_6(NH_4)_4.$$

From these formulæ, the author concludes: (1) That Prussian blue is not formed directly in the purifier, but by the oxidation of the ferrous cyanide; and (2) that the purifying material retains a portion of the cyanogen in the state of ferro-cyanide of ammonium. As the latter body is soluble in water, it is evident that the old material must not be washed, in order to recover the ammonia, before it is sent away to be treated—ferro-cyanide of ammonium having a much higher value than ammonia. It has been shown that sulpho-cyanide of ammonium exists in the purifier. Ammonia, acting only upon the cyanides and Prussian blue, is not injurious; but it is the mixture of ammonia and hydro-sulphuric acid which has to be avoided in the purifier when it is desired to limit the production of sulpho-cyanides. It is therefore necessary to arrest the ammonia, by as thorough a washing as practicable, before it enters the purifier. Following Dr. Burschell, the author recommends the avoidance by every possible means of high temperatures in the purifiers or during the revivification of the spent material. In an appendix to his communication, he gave a few particulars as to the treatment of spent products in gas-works. At present, they are much in demand by owners of chemical works; but as they contain only small quantities of cyanide—rarely exceeding 15 per cent. of ferro-cyanide of potassium—their transport is expensive. It therefore becomes a question of concentrating the cyanides. In order to do this, the spent material is mixed with lime. The cyanides pass into the condition of ferro-cyanides of calcium; the sulpho-cyanides become sulpho-cyanides of calcium; and the sulphide of iron is oxidized by the excess of lime. Washing follows; and the soluble ferro-cyanides and sulpho-cyanides of calcium dissolve. As a matter of fact, there are two processes principally in use. In the first, the washing water is concentrated, and the sulpho-cyanide of calcium is decomposed by heat, with, however, the liberation of certain secondary products having a very disagreeable odour. The result of the operation is ferro-cyanide of calcium, partly crystals and partly mud. In the second process, the liquor is treated with ferrous chloride. Ferrous cyanide is precipitated, and chloride and sulpho-cyanide of calcium remain in solution. The ferrous cyanide is then exposed to the air, and becomes transformed into very impure Prussian blue; its standard ranging from 35 to 50 per cent. The second process is the better one, inasmuch as it produces the higher yield.

M. Perthuis also (in conjunction with M. Guillemet) dealt with the subject of preventing frauds resulting from the tilting of gas-meters; an appliance having been devised by them for this purpose, which they claim to be effectual. A balanced plug is so adjusted as to cover the orifice of the water outlet when the meter is tilted, and to alter the position of the tube of the syphon-level. Fitted with this appliance, it is stated that a meter will not act unless the proper level has been ensured.

M. Perthuis further dealt briefly with the cost of heating by electricity as compared with gas. Applying Joule's law, he showed that by transforming the current of the hectowatt-hour into calorific energy, there are produced 86·4 calories; and that consequently the production of 100 calories requires an expenditure of 115·8 watt-hours of electric energy. At 0·5 c. per hectowatt-hour, 1000 calories would cost 5·7 c., for which amount the same number of heat-units could be furnished by gas at 30 c. per cubic metre, or 6s. 9d. per 1000 cubic feet. These data allow of a comparison being made between electricity and gas consumed in appliances now generally in use.

(*To be continued.*)

THE GAS TRAMWAY AT DESSAU.

We have received from Herr W. VON OECHELHAEUSER, the General Manager of the German Continental Gas Company, a print of the paper on the above subject read by him at the annual meeting of the German Association of Gas and Water Engineers this year. The following is an abstract translation of the paper.

Herr Kemper read before the Dresden meeting of the Association two years ago, a paper* on the application of gas-engines to the driving of tram-cars; and the German Continental Gas Company have aided the construction of a gas-driven tramway in Dessau, of which a length of 4·4 km. (2¾ miles) has been worked by nine gas-cars since last year. At the end of four weeks' working, the results were considered so satisfactory that

* See JOURNAL, Vol. LXIII., p. 152.

an issue of additional capital of £9000 for extensions of the system was over-subscribed by the public. Since Whitsuntide, the two trunk lines have been extended to the originally planned termini; and the full length of 6·2 km. (3·85 miles) has been worked by nine 7-horse power, four 10-horse power, and four supplementary cars. The favourable results of the working of the system, and the desire to further extend it, has led to the patent rights, which on the death of the inventor, Herr Lührig, passed into the hands of the Gas Traction Company in London, being secured by the German Gas Tramway Company, of Dessau. This Company have large works in the town for the building of gas-motor cars, gas locomotives, compressing stations, and other appurtenances of gas tramways. Gas tramways will come into operation shortly in Hirschberg and Saarlouis; while a great number of other towns contemplate adopting them.

Briefly, such has been the development of the gas tramway since the Dresden meeting of the Association; and I can now dispense with further description of the Lührig system of gas-motor tramways, and comparison of it with the competitive systems, by referring you to the articles which have appeared in the *Journal für Gasbeleuchtung*,* and to a pamphlet on "Gas for the Working of Tramways" which is published by the German Gas-Tramway Company. My present purpose is to indicate, by reference to the experiences gained at Dessau, the characteristic features of gas traction; then to discuss the results achieved there; and finally to briefly allude to the relation which the gas tramway bears to gas-works.

The three important elements of gas tramway working are the storage of gas, the motor, and the machinery; and of these, the storage usually evokes the greatest interest in the general public. Here there is a prejudice to be allayed, in the bogey of an imaginary risk of explosion through the carriage of the gas on the car. We, however, know that, for the past 25 years, more than 60,000 railway cars at home and abroad have carried gas at high pressure for combustion on the car, according to the admirable Pintsch system, without a single explosion, and without giving cause for the slightest alarm to passengers. You are aware that the great pressure in the reservoirs and pipes makes it impossible for air to enter and form an explosive mixture; while leakages caused by the frequent and severe concussions to which cars are subjected, are so much more easily traced on account of this pressure. Further, the reservoirs on tramcars are either exposed or in freely-ventilated positions on the car; and there is no naked flame near, as ignition is performed electrically in the motor, and the spark only passes within the cylinder. The connection for filling the reservoirs is now outside, and on one side of the car; so that neglect in screwing up the union is not attended with danger to the occupants. If possible, there is even less risk with the gas tramcar than with the railway carriage provided with Pintsch gas; for, in the tramcar, combustion takes place only within a cylinder built to resist the explosive force of the strongest admixture of gas and air, while on the railway, the gas burns within a glass bell in the roof of the carriage.

You are well aware that gas explosions attended by an incalculable rise of pressure could not occur in the motor; and that the maximum pressure for any given mixture of gas and air has been theoretically and practically established. The "slow combustion" of the gaseous mixture introduced in the Otto engines emanating from the Deutz Company, has met world-wide recognition. Gas-engine diagrams prove that the rise in pressure which takes place in the gas-engine through the gas exploding at the dead-point relatively slowly, is not more rapid than that which occurs on the admission of high-pressure steam to the steam-cylinder. Finally, the pressures in the gas-engine, which up to the present have not exceeded 20 to 30 atmospheres, are as nothing compared with the pressures of 100 atmospheres and over to which carbonic acid is compressed in steel vessels—there are now some 150,000 in Germany alone—for the use of publicans, and no one has been injured by these. Moreover, the railways convey holders charged with gas to 200 atmospheres pressure. In gas-motor cars, more than a tenth of this pressure is seldom reached; and the storage is similar to that on railway waggons. Since, however, even people well informed on technical matters have expressed fears of these gas-driven cars, I have taken this opportunity to again protest against their utterly unfounded terror.

The next point which occurs is the quite warrantable doubt as to whether the wear and tear of the gas-engine is not too great for the working of a gas tramway. Evidently the first half-year's working at Dessau cannot suffice to answer the question; and we must still fall back on indirect deductions from the working of stationary gas-engines. An exhaustive inquiry, undertaken by the Company I represent (the German Continental Gas Company), brought very favourable answers. In most cases, the repairs were confined to the renewal of piston-rings after continued work, and the sticking of the slide with the old-pattern motors; and these repairs could be generally undertaken by the attendants. The reports on gas-driven dynamos were especially favourable. Taking the record of the repairs during the 8½ years ending April 1 last, at the small electric station at Dessau, to gas-engines of 10, 30, 60, and 120 horse power, the cost averages only 0·006d. per horse-power-hour, or 0·12 per cent. of the initial cost, per year.

* See JOURNAL, Vol. LXV., p. 22, and reference on preceding page.

On appealing to the Prague Gas-Works for information as to the repairs effected on the three 50-horse power engines at the town electric lighting station, we received the astounding reply that the cost of repairs for a period of eight years was *nil*. Presumably this meant that the necessary repairs were effected by the ordinary attendants at no appreciable outlay. The 12-horse power engine used for the electric lighting of the Prague Gas-Works was also stated to have needed no outlay for repairs in eleven years; and one of the same power used for lighting the Council Chamber, entailed an expenditure of £7 15s. in nine years. At Munich, twenty 8-horse power engines in ten years cost £44 for repairs; and at Gladbach, a 12-horse power Otto twin-motor for electric lighting, cost £3 10s. in seven years.

From these figures, and the opinions of many technical men, it may be concluded that the need of repairs with properly attended gas-engines of good construction is beyond doubt as low as that of good steam-engines similarly attended. Indeed, several of the original Otto and Langen engines of 1867 are still at work. On what ground, therefore, can it be assumed that the gas motor on a travelling car would need more repairs than the steam-engine of the locomotive? The gas-engine is not more sensitive to dust than the steam-engine. In our works, it is used for coke-breaking in the midst of sharp coke dust; and gas-engines are in operation in numbers of small dirty workshops. The steam-engine on a locomotive is exposed to the dust; while in the Lührig cars, the gas-engine is entirely shut off from it, both within and without. The motors used have valve-motion with electric-ignition, instead of the ignition-slide, which was rather sensitive to dust. Both descriptions of motor are subject to the same shocks from the rails and at switches; and the Dresden gas cars for nearly a year have crossed 26 times daily five lines of railway metals. Thus each axle is daily subjected to 260 violent shocks; yet no special wear and tear to the engine has ensued. On a recent examination of the engines of the Dessau cars, the inner cylinder surfaces were found to be polished like mirrors; and according to the gauge, no change of dimension or uneven wear had taken place. This confirms the belief that we have nothing to fear from dust, as the wear would be very evident, and would rapidly advance, if such were the case. In the Lührig cars, the machinery is encased to protect it from dust and dirt.

There is yet another misgiving experienced by many technical men—viz., whether the transferring and reversing gear of the machinery is not rather complicated. In reality, the mechanism is simpler than it appears to be, and has only a certain complexity from the multiplicity of functions it fulfils—*e.g.*, regulation of speed and control of the direction of travelling. But when the controlling lever is moved to the proper position for the particular motion desired, it is effected by simple and direct gearing.

A remarkable corroboration of my opinion that the mechanism is very simple, comes from Professor A. B. W. Kennedy, of England, who recently visited the gas tramway at Dessau. In the address which he delivered as President of one of the sections of the British Association, at the meeting at Oxford in 1894,* he pointed out that simplicity was not really incompatible with apparent complexity, when the purpose of the machinery was regarded, and that directness is allied to simplicity in this respect. Then, in his presidential address to the Institution of Mechanical Engineers in 1894, this eminent electrician, after referring to the fact that electric traction, either with overhead or underground conductors, utilizes only 35 to 47 per cent. of the indicated horse power of a stationary steam-engine, while 70 per cent. of the power is utilized in the steam locomotive, goes on to say that there is no probability of this percentage being largely augmented, on account of the "indirectness" of the process and the loss of energy in the numerous transformations. Then, speaking of the difficulty of conducting electric power to the cars, he says that it has been overcome in America by the use of overhead conductors; but he hopes such a system will never be adopted in England, and believes that the introduction of electrical traction in the streets there will not be general until a good system with underground conductors has been invented. In the meantime, it is hard pushed by the rival systems of rope and gas propelled cars, of which he thinks the latter the more formidable. Gas acts more directly than steam, which necessitates a boiler; and though it is still quite in the experimental stage for traction purposes, he is sanguine of its future success. This testimony of Professor Kennedy is substantiated by the results of last summer's working at Dresden and this year's at Dessau, and in particular by the work during the snow and cold of last winter. The direct transmission of power to the axle in the gas-motor cars, without loss of energy through conversion, is the secret of the superiority.

Finally, there are two more trifling charges made against the new system—firstly, that there is a noticeable smell from the engine; and, secondly, that there is vibration, which is especially evident when the car is at rest. Now it may be said that a large number of the visitors to the Dessau tramway failed to detect either odour or vibration, even when their attention was drawn to the possibility of their existence. This fact proves that these evils can be done away with entirely, with a little further experience in the working of the cars. A lubricator for

* An abstract of the address here referred to appeared in the JOURNAL for Aug. 21 last year, p. 375. See also p. 464.

oiling the cylinder automatically, and so preventing too much oil being applied, with consequent production of smell, has been tested; and a more exact regulation of the gas admission will no doubt be secured, abolishing the vibration caused by careless manipulation of the lever.

Technical men who experienced two years ago the strong vibration of the cars in Dresden, can be convinced of the improvement by the absolute smoothness of the Dessau cars. The great defects and the many sources of interruption with other systems have yet to be overcome; and it may be assumed that improvements in detail of the gas cars will go on as rapidly in the future as in the past two years. It is not claimed that the new system is the best under all conditions—the special circumstances must in every case be considered. Nevertheless, the future may be trustfully looked forward to, as no disadvantages will ensue to vested interests through the advent of the gas motor system.

The *rôle* that compressed coal gas may play in the future, is indicated by the formation last year of a company at Havre for the running of small cargo boats between Havre, Rouen, and Paris; the boats being furnished with a motor and coal gas, compressed to 100 atmospheres in iron cylinders. The first boat of the kind was 100 feet long and 19 feet in the beam, and was provided with a 40-horse-power (effective) motor. It has carried a load of 145 tons a distance of 45 miles without refilling of the gas reservoirs. The work expended in compressing the gas does not increase proportionally with the pressure, but is relatively much less with high pressures. Thus only two-and-a-half times the power is needed to increase a pressure of 10 atmospheres tenfold—*i.e.*, to raise it to 100 atmospheres.

There is a prospect that the distances traversed by gas cars with one charge of gas may be greatly extended, and that gas motors may be used on small local railways. There is no immediate chance of acetylene being employed for motors, as, though it has approximately fifteen times the lighting value of common gas, it has only two-and-a-half times the heating value; and if it cannot be economically used for lighting, except under very exceptional conditions, there is no likelihood of using it yet for the development of power. Furthermore, rich gas is burnt with difficulty in an engine without deposit and clogging. Ordinary gas, of moderate heating value, is, as far as can be seen at present, the best.

Having disposed of the technical objections to the gas-motor tramcars, we next come to the consideration of the lessons and results of the gas tramway up to the present time. As already pointed out, the working continued with regularity through the hard winter. In the event of a car failing, it can readily be propelled also by the succeeding car, as each has an ample excess of power available; and thus no block is caused through the failure. The system has so far worked splendidly, and no considerable alterations have had to be made to the cars.

When we come to the financial aspect of the system, it is evident that a little more than a half-year's working, in the least favourable season of the year, cannot give figures of any great value. With a plant of this description, there are a number of extraordinary expenses in the first half year of its working, which do not subsequently occur; and no reliable factor for the general cost of repairs can be arrived at in so short a time. The wages of the driver and conductor are the same as with other methods; and the item which is peculiar to this system—viz., consumption of gas—is the most important among the remaining expenses. This charge has been determined, not only for a half year, but even for any given day; and the ease of checking this main factor of the expenditure is a special and unique advantage of the new system. Two meters in the compressing station give the amount of gas used in the work of compressing, and the quantity of gas compressed. The cubic content of the car reservoirs is known; and each being furnished with a pressure-gauge, the volume of gas within can be ascertained at any time, and the consumption on each journey found. If this is high on any day without readily assignable cause, the car is carefully examined for faults; and the same, when located, are remedied. During the first five months of this year, the average consumption of gas, including that consumed in the compressing engines, was 31·2 cubic feet per mile run, which is even less than had been estimated, notwithstanding the severe weather with which the cars had to cope. Compressing required 16·8 per cent. of the gas compressed, which is too large a proportion, and has since that time been reduced to 10·5 per cent. The total consumption of gas is therefore less than had been anticipated; and with more frequent trips, it will fall even lower in the future.

The plan and execution of the line influence the results of working to at least the same extent as the system of traction used, and must suit the particular system finally adopted. This is of great importance in respect to the power consumed. The Dessau line is of "Phœnix No 7" rails; and, except where there is wood pavement, it is laid directly on the gravel, and easily bears the weight of the cars.

If from the above it is concluded that the Lührig gas tramway is a success, the question occurs to the managers of gas and electrical works, as to which of them can most naturally provide the power for working tramways. In Dessau, the pioneers of the tramway had electrical traction in mind—especially as there was already in the town an electric central station. But on consideration, it was found that the dynamos only afforded the usual lighting current of 110 volts; and the cost of transforming it to one of 500 volts, which would be needed for the tramway, would be prohibitive. There was nothing for it but to put down new engines and dynamos; and those already installed would then be no better utilized than formerly. It was, however, impossible to raise the capital in Dessau; and as alternating currents have not been satisfactorily used for tramways, attention was turned to gas. The lines are in large towns always in the main streets, where the mains are large enough to meet the increased consumption; and thus no fresh expenditure is required for the distribution of the power. There is also great latitude in the choice of the position on the line of the compressing and filling stations, which need not necessarily be at the termini.

All the advantages which have been claimed for the consumption of gas for cooking and heating purposes, are present in its use for tramways. Two-thirds of it is day consumption; and it is greater in summer than in winter, as 25 per cent. more people travel in the former season. Thus, the tramway tends to equalize the day and night, and summer and winter consumption of gas. The more uniform demand would secure a better duty from the settings and apparatus; and moreover gas coal can be bought more cheaply in summer than in winter. The tramway consumption is equal to that of a large number of ordinary consumers; and therefore the expenses of registering such a quantity of gas, and collecting a number of accounts for it, are saved, and a greater profit is made on this quantity. The consumption of a tramway would, on the heaviest winter's day, be only about 1-400th of its consumption per year, which is half that of the ratio of the consumption for lighting purposes on the same day to the lighting consumption for the year. Therefore the extra capital for the supply of gas for tramways need be only half that required for supplying the same quantity of gas for lighting puposes.

If we take the actual, instead of the selling, price of the gas, the prospects for the gas tramway are even more hopeful. To give some idea of the consumption of a tramway, it may be pointed out that one car, according to its size and the traffic, requires from 800,000 to 1,000,000 cubic feet of gas (including that used for compressing); and that the adoption of gas as the sole motive power on the Cologne tramways, for instance, would cause an additional consumption of 70 million cubic feet of gas per annum. The transport of gas for power purposes has opened up an extensive new field for the gas industry.

The South Metropolitan Workman-Director Proposal.—When referring to this subject in last Friday's number, *Engineering* said: "Mr. George Livesey has again tabled his proposal to elect a workman as a Director in the South Metropolitan Gas Company; and . . . power is to be sought in the Bill to be re-introduced into Parliament. But the clause is to be permissive, 'to enable the Directors to allow the men to select a representative.' But whether permissive or obligatory, the point is valuable as showing that the system of profit-sharing is making real progress. Mr. Livesey has dealt with the gas-workers in such a way as to allay discontent; and the men co-operate well with the management, to the advantage of all concerned."

Protection of Underground Pipes from Electrolysis.—An article of some length which appeared in a recent number of the *Street Railway Review* describes a method of permanently protecting underground pipes from the effect of electrolytic corrosion. It is stated therein that nearly half of the energy generated by dynamos at full load is wasted in the conductors to and from the motors. Even with perfect feeder wires and rail joints, the currents in the pipes are only reduced; and they will still carry a considerable portion, suffering corrosion at the joints where the current leaves them. After discussing the various wiring systems in their bearing on electrolytic corrosion, the writer sums up the three essential problems in a successful method as follows: The pipes must be kept at least one volt negative to the rail at all points and at all times; the flow of current on the pipes should be diminished as much as possible; and permanent low contact resistance between the pipes and the feeder wires should be secured.

Manchester District Institution of Gas Engineers.—We learn from the Honorary Secretary of this Institution (Mr. S. S. Mellor, of Northwich) that the 103rd quarterly meeting will be held next Saturday, at Buxton, under the presidency of Mr. G. Smedley, the Engineer and Manager of the gas-works there. The members will leave the Central Station, Manchester, so as to reach Buxton just before eleven. Upon their arrival, they will be conveyed to the gas-works, where they will be received by Mr. E. C. Milligan, the Chairman of the Gas Committee of the Urban District Council. Luncheon will be partaken of at the Royal Hotel; and the business subsequently transacted. One new member will be proposed for election; and Mr. R. G. Shadbolt, of Low Moor, will read a paper entitled "Some Experiences in Gas Purification." After the business, the members and their friends will be taken by coach to the "Cat and Fiddle" Inn, which, we believe, claims the distinction of being the highest licensed house in the kingdom, and return *via* Axe Edge. Tea will then be served at the Royal Hotel; and Manchester reached about nine o'clock.

ILLUMINATING GAS FOR HEATING PURPOSES.

At the International Congress of Hygiene and Demography held last year at Buda-Pesth, Mr. Frederick Siemens read a paper on the above subject, in the course of which he described the stove, constructed by him on the regenerative principle, of which Professor Lewes spoke so highly in the course of his paper "On the Combustion of Coal Gas for Fuel Purposes," at the last meeting of The Gas Institute. The following translation of Mr. Siemens's paper appears in the August number of the *Engineering Magazine*.

There is hardly any more important and more difficult question to be solved than the rational heating of dwellings. This is evident from the fact that, though many systems and constructions have been applied, not one exists which meets all the requirements. A heating appliance must be cheap, not only as to first installation, but especially as to operating expense; it must be easy to attend to, and must not require any intelligent attendance; and above all, it must be agreeable, and not detrimental to the health. Furthermore, it must be easily regulated (preferably by an automatic device) and must not cause any nuisance outside. For instance, it must not evolve any smoke—that being very often the cause of complaints in otherwise good heating installations.

How are these requirements met in practice? The first installation is too expensive in most of the central heating systems, which show lesser or greater deficiences according to the system employed. The hot-air heating system has a very disagreeable effect on the organs of respiration, for the reason that the air is hot and dry. From a hygienic standpoint, therefore, it is to be condemned, because the air which we breathe should be cool, and nearly saturated with moisture. On the other hand, the existing systems are too expensive in operation, as, for instance, the English grate, which probably best meets the hygienic requirements in a dwelling, but which vitiates the air of the neighbourhood—at least in large cities—with the escaping smoke and other products of combustion. The English grate heating system is very expensive on account of the large waste of fuel, and because it makes necessary continuous care of the grate. In other respects, it is agreeable and comfortable, mainly because only radiating heat is employed, similar to the heat from the sun, which is certainly the most agreeable and hygienic heat. Heating by large porcelain tile stoves is cheap; but from a hygienic point of view it is bad, as almost no radiating heat is obtained. The convection of heat by means of these large, moderately-heated porcelain stoves is effected in the main by the circulation of the air, as the air in the room rises against the heated surfaces of the stove, and falls against the cooler walls of the room.

The advantage of the porcelain stoves consists in the moderate degree to which the surfaces of the stove are heated; but, from a hygienic point of view, this mode of heating must be condemned, because the effect is about the same as that of the hot-air system. The circulation of the air, as described, heats the air of the room, while in the English grate system the radiating heat leaves the air of the room cool, but, on the other hand, heats the walls and all the objects in the room in exactly the same manner as the sun heats everything in Nature. Another very uncomfortable, but simple, method of heating is by means of the so-called "Cannon" stoves. These stoves are usually made of iron. They get very hot on the outside, and therefore radiate much heat. They act less by heating the air than by radiation; but they vitiate the air in the room in other respects to a very high degree. The heated iron permits the poisonous gases of combustion (for instance, carbonic acid gas) to pass through it. Besides, the air in the room rises against the hot surfaces of the iron stove, as in the case of the porcelain stoves; only the air gets heated to such a degree that it burns and carbonizes many particles of dust composed of organic substances always prevalent in air. This causes a highly disagreeable odour, which will always be found where stove surfaces heated to a high degree are exposed to the air of the room. I classify under the heading "Cannon" or iron stoves all stoves of which the external surface is heated to more than 212° Fahr. These iron stoves exist in innumerable types, and are made under many systems, but are usually employed only as makeshifts; it being unbearable to any human being to breathe for any length of time the half burned and singed organic matter contained in the air.

It can be easily seen that the temperature of the surface of a stove should be kept below 212° Fahr. This is the reason that in all countries with cold and long winters, where the necessity for heating apparatus is the greatest, the large, moderately-heated porcelain stoves are generally used; while in countries with moderate winters the iron stoves prevail, because heating apparatus is used rather exceptionally. In all central heating systems, the low-pressure steam heat is preferred, though the first cost and the operating expenses are comparatively high, on account of the large heating surfaces needed. The "air under" system is more agreeable and healthful than in cheaper installations, which operate with smaller heating surfaces and higher temperatures.

I might go into still more detail in these comparisons; but I assume that I shall be readily understood when I say that, for heating dwellings, the ideal apparatus is one which generates a large amount of radiating heat, but exposes only very moderately heated surfaces. This leads me to the consideration of the regenerative gas-stove, which was constructed to meet these ideal conditions. As a common gas-flame does not radiate more than 30 per cent. of its heat, I increase this percentage by using an intensely white regenerative gas-flame, similar to that used for lighting purposes. Such a flame radiates, on account of its much higher temperature, at least twice as much heat as does the common gas-flame. However, the escaping products of combustion of the very hot flame convey less heat to the stove, because the regenerator absorbs most of the heat of combustion for the purpose of heating the necessary amount of air previous to combustion.

In order to make myself clear on the subject, I want to state that I commenced about twelve years ago to manufacture heating-stoves for illuminating-gas and with regeneration of heat, which were also called "accumulators." In 1885, I obtained my German and other patents; and I then commenced to offer such stoves to the public. The result was that a good many competitors appeared, offering stoves to be used with illuminating gas, partly with and partly without radiating heat, but all without a heat-accumulator. In the beginning, these gas heating-stoves did not find favour, partly on account of the erroneous supposition that the use of illuminating gas would be too costly, and partly because the intensely illuminating regenerative gas-flame had a blinding effect on the eye. When, finally, a few years ago, during the Brussels Exhibition, such a stove, without a regenerator or accumulator, made its appearance, in which the heating radiating gas-flame was invisible, but gave its effect indirectly by means of a copper reflector, it found more favour with the public.

Since the appearance of the indirectly operating reflector, which I employ also, the demand for regenerative gas-stoves has increased considerably, in spite of the many competitors who do not employ regenerative apparatus, but succeeded nevertheless in selling a good many stoves on account of their cheapness, and because they called them "regenerative" or "double regenerative." I would not care about this competition if the public were not deceived by cheap stoves, falsely called regenerative—thereby injuring the reputation of the system. As it would take too much space to relate the whole business development of my heating system, I confine myself to its description as it stands to-day.

The drawings figs. 1 and 2 [next page] show, in two cross sections, that the heating apparatus consists of two main parts—viz., the simple radiating grate arrangement A, and the stove B, which is built over the grate for the complete utilization of the remaining heat. The gas heating-flame is formed by leading illuminating gas through the horizontal pipe V, which is located above the reflector R. The pipe contains in the forward direction one or more fine holes, through which the gas can escape in horizontal flames.

The air necessary for combustion flows at the beginning—that is, when the apparatus is cold—out of the space in front of the reflector to the burners. The flames are pointed horizontally and forward, as shown, and radiate a great deal of their heat on the reflector R. Then they are led through the downward channel M of the regenerator C, and then again forward through the channel N in the upper part of the stove B, and finally escape through the stove-pipe E. In leading the products of combustion downward, the regenerative apparatus is heated as contemplated. The necessary air of combustion, which is, of course, cold, enters now through the vertical regenerator channel E from below. The air then moves in a direction opposite to that of the products of combustion, which are moving downward in the shaft N; and in this manner the air absorbs the greater part of the heat of the products of combustion. Then, highly heated, the air mixes from above and below with the gas escaping out of the pipe V. The air channel E, on account of its heating by the products of combustion, and of its almost vertical position, becomes a small chimney, and conducts the hot air to the gas-flames automatically—*i.e.*, independently of the main chimney E.

This automatic conveyance of the hot air is a highly important requirement, because the whole heating apparatus becomes independent of the unreliable draught of the chimney, and may be employed even where there is no chimney at all. In the latter case, however, the products of combustion would escape into the room, which must be obviated for hygienic reasons. The products of combustion, already considerably cooled in the regenerator C, now heat, in the moderate manner desired, the upper part of the apparatus, the real stove B, which consists of a number of boxes K, so arranged that they leave spaces, and constitute a large extended heating surface, in order to utilize in the best possible manner the remaining heat. Provision is also made for the evaporation of water in the upper part of the stove, in order to saturate to a certain extent the dry air generated by the stove B.

An important part of the whole heating apparatus is the reflector, which, as can be seen from the drawing, is so arranged that the rays of light and heat falling on it from above are reflected forward and sideways, while the intense white flame itself cannot be seen from the room. By means of the reflector—the material, colour, and surface of which are so selected that

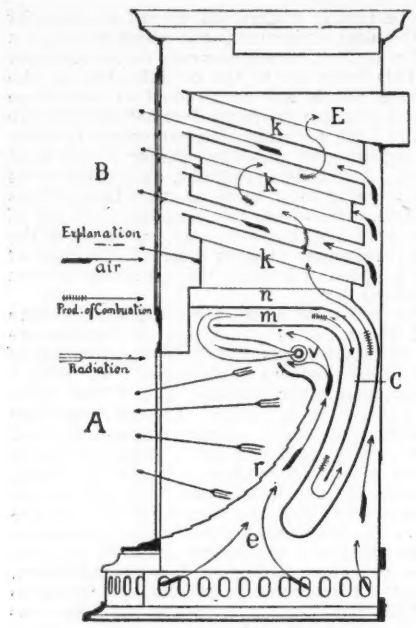


FIG. 1.

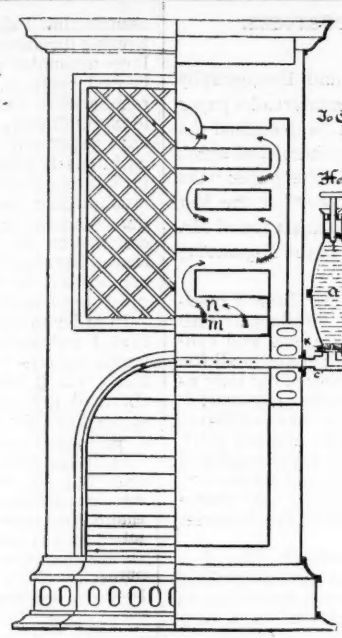


FIG. 2.

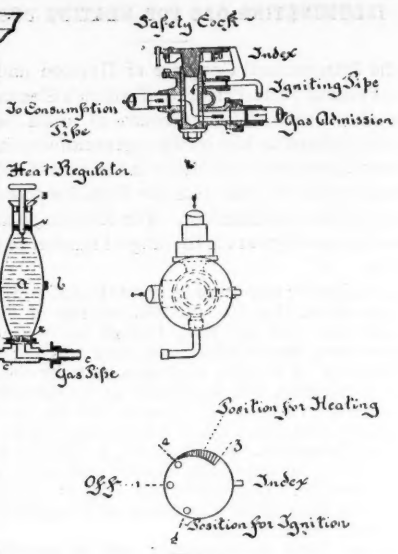


FIG. 3.

the rays of heat are thrown completely into the room without disturbing the eye by the rays of light or the images of the burners—the room is mainly heated in the lower part, so that at the height of (say) 5 feet the temperature is considerably lower than at the floor. By such an arrangement, the comfort is greatly increased, and waste of heat is prevented—a waste which must exist when, as in the other heating systems, the ceiling of a room is heated while the floor remains cold. I describe the upper part of the heating apparatus (the real stove B) only superficially, because this part does not show any novelty, and might even be omitted under certain conditions. Where considerations of the greatest economy do not exist, it might be well to use only the lower part of the heating apparatus—the real grate A, with its excessive radiation of heat. With the small surfaces of the stove B, and with its low degree of heat, the effects of the stove must be the same, though in a small degree, as in the large porcelain stove already described. As, by means of the regenerative system, a much greater part of the heat generated by combustion is converted into radiating heat, and led to the room in the most advantageous manner, it is the more advisable to do away with the stove B. Lately this arrangement has met with much favour, especially in the more luxurious dwellings.

Another highly important advantage, which is made possible only by the application of illuminating gas for the generation of heat, consists in the possibility of the application of an automatic regulator. This heat regulator, which may be adjusted for any desired temperature, raises or lowers the temperature by permitting more or less gas to flow to the burners. This arrangement not only adds to the comfort, but prevents the waste of gas. It is fair to assume that the consumption of fuel in all other heating systems is increased by the lack of an automatic heat-regulator, because the heating is effected without regard to the existing temperature. The consumption of fuel, of course, could be diminished if an economical mode of heating were adopted. But this is not alone sufficient; it is necessary also to adjust the heating in accordance with the continually changing demand for heat. As the automatic heat-regulator permits the use of fuel in exact proportion to the momentary demand, and as the generated heat is directed by means of the reflector to the place where it is needed, the gas heating-stove shows an actual saving in fuel in comparison with all other systems, in spite of the comparatively high price of illuminating gas.

The heat-regulator constructed by me is shown in fig. 2. It consists of an oval metal vessel A, to which is attached below a telescoping arrangement *Z*, made out of thin tin. To the lower end of the telescoping arrangement is attached a small cone K, which serves to regulate the flow of gas through the pipes C and C^1—C being inside of C^1. The pipe C is connected with the gas service-pipe; and C^1, with the stove. The flow of the gas is indicated by the arrows. The vessel A is provided in its upper end with a small pipe, which terminates in a little funnel T; the latter containing a small needle-valve V, which may be opened or closed by means of a thumb-screw S. The whole apparatus is filled with water in such a manner that the water becomes visible in the funnel and does away with air bubbles. Hoop B may be compressed by means of a screw; thus compressing A more or less, so that the water in the funnel will visibly rise or fall. As soon as the whole apparatus is regulated so that the cone, at a certain temperature—say, 54° Fahr.—with the needle valve closed, permits a sufficient quantity of gas to pass, the water in the metal vessel will expand with any rise of temperature. This will cause the telescoping arrangement to move the cone in a downward direction, and consequently the flow of gas will be partially or entirely shut off. If the water in the vessel cools, the telescoping arrangement will contract, and the cone will again permit the passage of the gas in proportion to the degree of temperature. The advantage of such a temperature-regulator over other well-known devices lies in the fact that, in case of any escape of the liquid, the needle valve may be opened, and water may be added through the funnel until the apparatus is again properly adjusted.

Another important device is the safety-cock S with self-igniter (fig. 3). This cock is so constructed that it can be turned only in one direction, and only step by step. If the index points to step 1, the cock closes. If the index turns to step 2, the igniting flame touches the gas service-pipe. The next step connects that pipe with the main flame. This is ignited by the igniting flame, and the latter is again shut off, so that when the index points to step 3 only the main flame is burning, and the igniting flame is shut off. Between steps 3 and 4, the hand may be moved to and fro for the admission of more or less gas, as indicated by the scale. If it becomes necessary to extinguish the flame, the index is set to 1. Such a safety device is very important, because (without it) negligence and ignorance may cause many bad results. Even malicious intent could cause an irregularity only when assisted by technical knowledge.

In closing this paper, I beg to draw your attention to the fact that probably illuminating gas will be superseded to a very large extent by the electric light. It is, however, a rather curious coincidence that electricity for heating can find only a limited application, while, on the other hand, illuminating gas is particularly adapted for it. Illuminating gas as fuel is not only applicable for heating-stoves, but for all feasible domestic and technical purposes. It is well suited for cooking, melting, annealing, and other operations. It has become more and more evident that illuminating gas is particularly adapted for heating purposes, on account of its great radiation of heat—this being the best for heating purposes. Where heating by contact is required, we may apply Bunsen or similar burners; so that even for these purposes the illuminating gas can be well employed. I beg to remind you of the Auer incandescent light, and various cooking and heating appliances. In most of the heating and melting operations, especially in all cases where the regenerative system can be used with advantage, it is the radiating heat that we want, as I pointed out some years ago in my several papers read in Germany and England. I refer to these papers, and to the success I have achieved with my regenerative gas-stoves in many technical industries, especially in those connected with glass and steel.

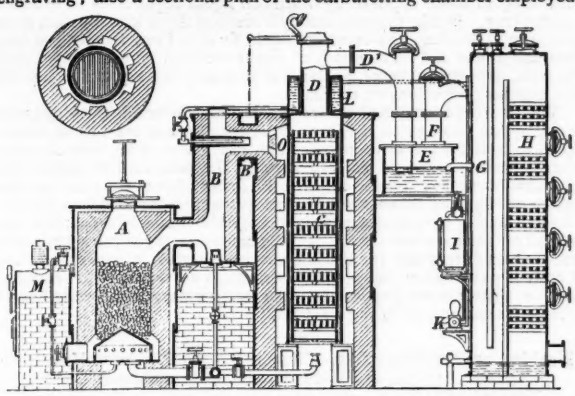
I think I may predict that the present illuminating gas will gradually change its *rôle*, and will be used in future mainly as fuel. Especially in large cities would this change be advantageous; but, in order to obtain this result, the illuminating gas, or rather the heating gas, must be considerably reduced in cost. Prospects for such reduction are good, because gas prices have been continually on the decline, and larger competition and the great progress made in the methods of manufacturing gas will contribute their share, especially if the gas is used to a larger extent for heating purposes.

The Oil-Gas Experiments at Bradford.—The Gas Committee of the Bradford Corporation have instructed Mr. L. T. Wright to prepare a supplementary report on the Dvorkovitz process, dealing with various points not previously touched upon in the report briefly noticed in the last number of the JOURNAL.

REGISTER OF PATENTS.

Generating and Carburetting Water Gas.—Fourness, W. A., of Manchester, No. 14,885; Aug. 3, 1894.

The general arrangement of this water-gas plant is shown in the engraving; also a sectional plan of the carburetting chamber employed.



A is the generator; B, the pipe leading from it to the carburettor; C, the carburettor; D, the outlet-pipe leading to the hydraulic seal E; F, the pipe leading to the condenser G, with the scrubber H; I, the oil cistern; K, a small oil-pump; L, an oil-heating cistern; and M, a steam-boiler—these parts being (with few exceptions) constructed in any ordinary manner.

The improvement in the generator A consists in placing at the bottom of the chamber containing the coke or fuel, a cast-iron plate, raised in the centre and sloping downwards towards the periphery, and supported preferably by a cast-iron cylinder; also in forming an annular space or flue round the cylinder and plate into which the ashes can drop off the cover—doors being provided for cleaning out the ashes.

The steam for producing water gas is conducted from the boiler M to a cylindrical box—entering preferably from the bottom, so as to strike the plate or roof, and become superheated by contact therewith, after which it issues through lateral openings into the annular flue, and passes to the fuel.

The carburetting apparatus C consists of a fire-brick jacket in a shell, and a cast-iron cylinder or pipe fitted with a number of cast-iron grids or perforated trays. The cylinder, which is open at the bottom, is supported so as to be raised off the floor. It is surrounded by a jacket of fire-brick of such diameter that an annular space is left round it, communicating at the top end with the top of the generator A through the pipe B, so that the gas from the generator enters the annular space at the top, passes down outside the cylinder, and up through the inside. The top of the cylinder is fitted with a cover, having an outlet-pipe D provided at the top, with a valve or damper that can be opened or closed by means of a lever and chain. A branch on the pipe D leads through the elbow-pipe D^1 to the hydraulic seal E. Below the open end of the central pipe an air-supply pipe or blower connects with a blast-pipe. The nozzle of the blower is preferably arranged as shown, with a closed end and lateral outlets, and the end-plate projecting over the sides, so that the air issues from the blower and enters the cylinder in a diffused state.

The oil for carburetting is contained in a cistern I, from which it is drawn by a pump K, and forced up into a cistern L, placed upon the top of the carburetting apparatus and surrounding the outlet-pipe D, so that the oil becomes heated therein. It then passes through the pipe S shown, and issues (in a more or less vaporized state) into the space surrounding the cylinder C.

The plant may be operated in the following way: After the fire has been lit in the generator A, and the apparatus generally heated (the damper being open), coke is charged into the generator, the lid of which is then closed and the air-valve opened. The coke is thus blown into incandescence; the air being heated and distributed all round the generator, as described. The hot gases pass through the pipe B into the jacket at the top, and descend in the same (the current being broken up by projecting baffle bricks), and enter the cylinder C at the bottom end. The current of air thus mixes with the gas, which usually contains a considerable quantity of carbon monoxide, so that the latter is burnt, whereby an intense and rapid heating of the cylinder C and the cast-iron grids or plates in it is effected. The gas then passes out through the pipe D into the atmosphere. Air may also be supplied to the gas in the pipe B, so as to burn part of the combustible components, and obtain an intenser heat at the top of the carburettor. After the coke has become sufficiently incandescent, the air-blasts are shut off, and the damper closed. The steam-valve is then opened, and steam blown in until it issues into the annular space round the generator, after having become superheated by contact with the roof of the chamber. The water gas formed by the steam and coke passes up the pipe B, and enters the surrounding jacket. The pump, on being started, draws oil from the cistern I, and forces it through the heater L and the pipes connected therewith, where it becomes more or less vaporized, and mixes in that state with the water gas. The combined water gas and oil vapour then pass down the jacket and up the cylinder C, in which, by contact with the heated walls and grids or chequer work, the oil vapour becomes decomposed and incorporated in the water gas. The carburetted water gas passes through the pipe D^1 into the hydraulic seal E; thence through the pipe F into the condenser G and scrubber H, in the direction indicated by arrows; and finally out of the outlet to the gasholder.

Electric Apparatus for Lighting Gas-Burners.—Eliasson, L., of Paris. No. 16,710; Sept. 1, 1894.

This invention refers to an electric lighter specially applicable for gas-burners of the Welsbach and analogous types. It is so arranged that when it is wished to light the gas, a button placed anywhere in the electric circuit is pressed; and the current passing a platinum wire becomes incandescent, and an armature is attracted to a bobbin. The ratchet on the armature causes the plug to turn through an arc of 45°. Gas thereupon passes into the auxiliary burner, by the hole in the plug, and by the channel in the conical opening into which the plug is fitted; and it is ignited on contact with the incandescent wire. By pressing the button a second time, the armature, which has been again lifted by its spring, again descends, and causes the plug to complete the quarter turn. The gas then passes to the burner, and ignites by contact with the flame of the auxiliary burner, into which the gas then ceases to enter. If it be wished to decrease the intensity of the flame, the button is again pressed; the armature is again attracted; the plug is again moved; and the gas is turned down. Another pressure on the button will cause the gas to be turned off; and the apparatus is then in position to recommence its cycle of operations.

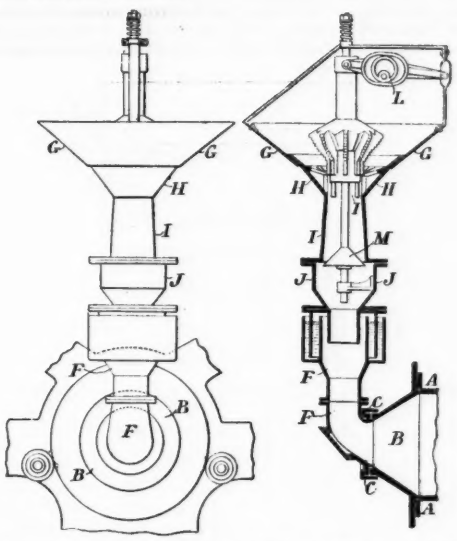
Carburetting Air.—Coutts, J. F., of Woolwich. No. 16,923; Sept. 5, 1894.

This invention (in the words of the patentee) "relates to an improved apparatus for overcoming the difficulty experienced in carbonizing air (commonly called 'air gas') in winter, when, owing to low temperature of the atmosphere, it does not readily carbonize, and is therefore all but useless for ordinary purposes."

The *modus operandi* is as follows: The generating chamber is filled with animal or vegetable fibre, which acts as an absorbent; and it is then charged with spirits, and certain regenerative burners fixed in contact with this chamber are turned on and lighted. The air that has entered the apparatus comes in contact with the spirits; and, becoming saturated, gets heavier than when pure, and falls to the bottom of the chamber. It here furnishes an air gas to supply the three regenerative burners, the flames from which heat the blast, which forces air (under pressure) through and out of the generating chamber, and "assists the same to become carbonized."

Manufacturing Gas from Coal.—Dinsmore, J. H. R., of Liverpool. No. 17,555; Sept. 15, 1894.

According to this invention, there is combined with a coal-distilling retort, a feeding device, by which the coal is automatically fed to the retort without opening it, and by which the feed is practically continuous. It is "more particularly designed to be used in connection with retorts in, or by, which coal is moved or worked and discharged mechanically, as, for instance, rotary retorts, by which the discharge of coke is automatically effected."



The accompanying illustration shows the application of the invention to the feeding of coal continuously and automatically to a rotary gas-making retort; as, for instance, a retort of the type described in patent No. 23,950 of 1893.

A represents the inlet-end of the rotary retort, of which B is the mouth, and C the joint between the rotating mouth and the stationary part. With regard to the feeding mechanism (the subject of this invention), above the elbow F, which conveys the material supplied to it to the mouth B, there is a feed-device, comprising a hopper G, a mouth H having a floor with longitudinal slots therein, and a tapered cylindrical shoot or chamber I with vertical slots in the upper part of it. The floor, the upper part of the cylinder I, and the outer part of the mouth H, form an annular chamber at this part. On the lower part of the chamber I is a box J, which has on its lower end a cylindrical tubular projection that fits in the annular vessel, making a lute joint therewith. There is also a discharge-shoot, through which the fuel is shot into the mouthpiece elbow F.

The mechanical feeding device consists of a plunger nearly filling the tapered cylindrical chamber I. On this part, there are formed substantially parallel projecting parts, which work in connection with the vertical slots; and above these again are gradually extended projecting ribs, notched at their outer edges, and adapted to work in connection with the slots in the floor of the hopper mouth. The plunger is moved up and down by a cam L on the shaft, working in connection with a lever, the outer end of which is fixed on a bar, and the inner end on the upper part of the feeding device. The action of this part is that, when the plunger is in the lower-most position, the top of the projecting part or ribs will lie within the slots, and the lower end of the

plunger will have passed the lower ends of the slots. In this position communication between the chamber I and the hopper G is practically cut off; and the material below the plunger will be in a closely pressed condition. Then, in the return action, the material that lies within the annular chamber round the top of the chamber I and that above, can fall through the slots in the floor H, and into the chamber I. In the downstroke, the material under the projections will be forced into the chamber H by the projections; while that lying below the plunger will be forced downwards into the chamber I. This latter chamber is always full of coal; it being held up therein by the valve M, mounted on a shaft (which serves as a vertical support and slide for the plunger-device to work on), and held on its seat by a spring. Thus, when the material is forced downwards by the descent of the plunger, it opens the valve, and falls past it into the box J, and so down into the conduit leading to the retort. As soon as the descent of the feed-plunger ceases, or it begins to rise, the valve M is closed by the spring.

By this action and construction, crushed coal is fed practically continuously to the retort, and without admission of air—that is, the air is excluded from the chamber I by being constantly filled with practically closely packed coal, from which the air has been expelled by the feeding action and compression of it by the means described.

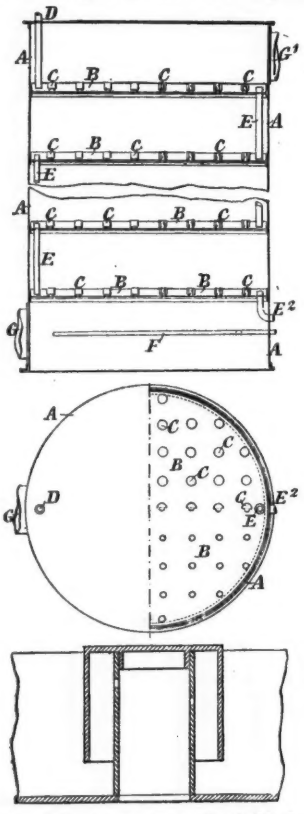
The upper part of this feeding apparatus—namely, the box J, the chamber I, and the hopper G—is supported and fixed in any convenient way, and made independent of the retort and parts connected with it by the loose joint connecting the box J with the elbow part F, which is supported from the mouthpiece B of the retort by a joint, such as described in the 1893 patent.

Carburetting Gas.—Blake, H. T., of Ross. No. 17,873; Sept. 20, 1894.

This invention relates to apparatus for converting "Dowson gas" into a gas which may be used for illuminating purposes." The process of conversion (in the words of the patentee) consists in passing the Dowson gas through a series of chambers, in a closed vessel, packed with cotton wool, or cotton waste, and charged with benzoline, thereby enriching the Dowson gas, and rendering it suitable for illuminating, by means of the ordinary gas fittings and burners.

Enriching Gases by Liquid Hydrocarbons.—Dvorkovitz, P., of Bishopsgate Street, E.C. No. 18,078; Sept. 22, 1894.

This invention refers to means "whereby gases, such as coal gas, more especially, or other gases used for lighting and heating purposes, can be very efficiently enriched by liquid hydrocarbons." The liquid hydrocarbon is caused to pass down through a vessel, in which it forms successive layers; and the gas to be enriched is caused to pass through these layers in succession—the gas being, if necessary, previously heated to a temperature requisite to allow it to efficiently take up the enriching constituents from the liquid hydrocarbon as it passes therethrough. The gas, when enriched, passes off from the enriching vessel "at a temperature low enough to prevent its subsequent deterioration."



A vertical section of the apparatus, and a half plan and half horizontal section are shown in the illustrations; also an enlarged view of one of the "covering caps" referred to later on.

A is the casing or shell of a tower, containing trays B, arranged at suitable distances apart one above another. In the bottom of each tray are a number of openings, each surmounted by a tubular projection closed at its upper end by a cap C, provided with two downwardly projecting concentric rims—the inner one fitting the interior of the tubular projection, while the outer rim is of sufficient diameter to form an annular space between the interior of it and the outer surface of the tubular projection. The rim is of sufficient length to extend to within a short distance from the bottom of the tray. Near the upper end of the tubular projection are perforations, opening into the annular space. Liquid hydrocarbon is admitted by a pipe D on to the uppermost tray of the series. It overflows on to the next tray below by a pipe E, the upper end of which stands up above the bottom of the tray to a height equal to the depth of hydrocarbon liquid required to be retained on the tray. In like manner, the hydrocarbon flows in succession from one tray to another, any excess of liquid flowing from the bottom tray through a pipe E^2. The depth of liquid retained on each tray should be such, says the inventor, as to reach to nearly the top of the caps on the tubular projections on the trays.

The gas to be enriched enters the chamber beneath the lowermost tray, by the passage G, in which there may be a steam-coil, as shown at F, to heat the gas as it enters. The gas passes from this chamber into the tubular projections, and through the perforations therein into the annular spaces; thence beneath the lower edge of the rims into the space or chamber between the lowermost tray and the next tray above—the gas having been caused to pass through the liquid hydrocarbon contained on the lowermost tray. In like manner, the gas passes upwards through each tray and the liquid contained therein, in succession; and finally it passes from the apparatus through an outlet G^1, "enriched by the hydrocarbon liquid, and at a temperature sufficiently low to ensure its enrichment being retained."

Washing or Scrubbing Gas.—Hersey, S., and Kirkham, Hulett, and Chandler, Limited, of Palace Chambers, Westminster. No. 18,440; Sept. 28, 1894.

This invention of "improvements in apparatus for washing or scrubbing gas," has for its object "to obtain a large amount of wetted surface by means of a simple and economical construction." For this purpose, the patentees propose to construct discs of segmental bundles, each made up of laths placed one above another edgewise; the laths, as they approach the lower end or centre, becoming gradually shorter. The laths are threaded on horizontal bolts in rows or sections, with distance-pieces between them; and the several rows or sections are connected into a bundle endwise, by means of end-plates and a central bolt.

Fig. 1.

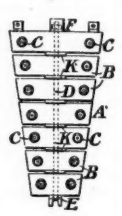


Fig. 2.

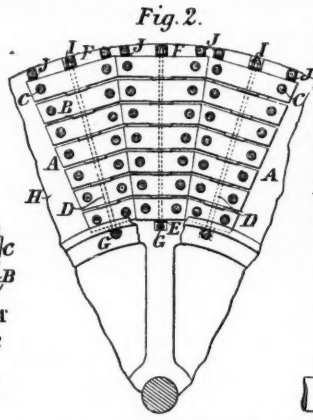
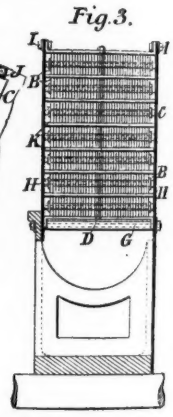


Fig. 3.



As shown in figs. 1, 2, and 3, the several laths of each row or section are connected together by horizontal bolts C (distance-pieces being arranged upon the bolts between the laths); and the several sections are connected together by the longitudinal bolt D, which passes through the two clamping plates E F. The plate E has recessed lugs, by means of which the segment may be engaged with a transverse bolt G in the drum, the side-plates of which are indicated by the letter H, and the clamping-bar F being provided with lugs having holes for receiving fixing bolts I, which pass through the plates H and clamping-bar F.

In order to further ensure the retention of the segments in the drum, retaining bars are arranged for, such as J, which are bolted to the two side-plates H of the drum, and are in contact with the uppermost section of each segment. K are the distance-pieces arranged between the several sections; the longitudinal bolt D passing through the distance-pieces, in order to retain them in their proper positions relatively with the section.

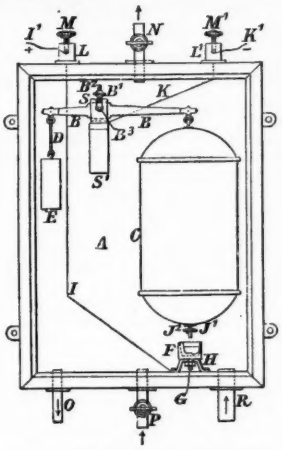
Various modifications of the arrangement here described are detailed in the specification.

Apparatus for Giving Warning of the Presence of Escaped Gas in Rooms or the like.—Haddan, R.; a communication from José Serra and Co., of Barcelona, Spain. No. 11,703; June 15, 1895.

This apparatus—intended to serve for automatically giving warning when a dangerous quantity of a gas (such as ordinary illuminating gas) has been mingled with the air of any room—essentially consists of a balance-beam, one arm of which carries suspended "a hollow, voluminous, unalterable, light, and hermetically closed vessel or body; while the other arm is balanced by a weight of less volume." The balance is provided with a metallic pin, which, on going downward, dips in a basin containing mercury; and both balance and basin are inserted in the circuit of an electric bell.

As shown in the engraving, the beam B has two arms of unequal length, resting with knife-edges B^3 on a support S^1. From one of the arms is suspended a hollow body C; while the other arm is balanced by a weight E, attached thereto in a similar manner. In order to give the body C a larger play of movement, the arm carrying it is made considerably longer than the other; but even if the two arms were of equal length, the principle of working of the apparatus would in no way be altered. Underneath the hollow body C, there is a metallic basin F, fastened by a screw G to a loop-like socket H, secured to the bottom of the box; the spindle of the basin passing through the socket,

is adjusted so as to assume any desired level. At its lower extremity, the body C is provided with a platinum needle, to be immersed in the mercury of the basin or vessel according to the relative position of the arms B. Over the surface of the mercury is a layer of glycerine, the object of which is to prevent oxydation of the needle point and keep it covered, lest in the case where the surrounding atmosphere is composed of an explosive mixture, it should communicate a spark from the electric circuit, and so cause an explosion. The basin F is connected to the positive pole of a battery by means of the conductors I and I^1, fastened by a set-screw M; while the support S^1 for the beam B or the knife-edge B^3 respectively, has connection with the negative pole by means of the conductors K and K^1, fastened by the set-screw M^1. A bell apparatus is inserted in the electric circuit, in combination, when desired, with registering apparatus.



The apparatus is encased in a box A. R is the tube for communication with the space or room to be controlled as to the variations of the density of its atmosphere; and O is the air outlet-tube of the box A. Cocks P and N serve to air the box A after an observation has been made, so as to accelerate the exit of the mixed atmosphere which it should happen to contain, and thereby restore the equilibrium of the beam B.

In the position of equilibrium, the point J is not immersed in the mercury; consequently, the circuit is interrupted. But should the atmosphere of the room to be controlled become lighter, for instance, through an escape of lighting gas, it will fill the box A through the tube R; and the body C will then sink. The point J will thus be immersed in the mercury of the basin F, and close the circuit and set the electric bell in operation.

APPLICATIONS FOR LETTERS PATENT.

14,819.—Bennett, H., and Wooler, E., "Automatically lighting and shutting off the gas of the burners connected with gas-stoves." Aug. 6.

14,826.—Fulleylove, W. K., "Petroleum gas-lamp specially adapted for incandescent lighting." Aug. 6.

14,834.—Golby, F. W., "Lighting incandescent gas-lamps." A communication from E. Dispot. Aug. 6.

14,838.—Burin, H. B., "Gas forge and furnace." Aug. 6.

14,855.—Huntington, A. K., "Manufacture of cyanogen." Aug. 6.

14,973.—Webber, W., "Prepayment apparatus for attachment to gas, electricity, or other fluid meters." Aug. 8.

15,045.—Lanchester, F. W., "Gas and oil motor engines." Aug. 9.

15,048.—Foulis, W., "Manufacture of gas." Aug. 9.

15,066.—Frank, A., and Caro, N., "Production of cyanogen compounds." Aug. 10.

15,125.—Gregory, R., "Coupling lead and other soft metal pipes together." Aug. 12.

15,166.—Peletan, J. H., and Christophe, E., "Electrophores applicable as electric lighters." Aug. 12.

15,168.—Foulis, W., and Holmes, P. F., "Obtaining cyanides from gases." Aug. 12.

15,216.—Webb, F. A., "Electric lighting attachments for gas-burners." Aug. 13.

15,228.—Newton, A. V., "Raising the temperature and illuminating power of flames." A communication from A. Nobel. Aug. 13.

15,246.—Crocker, S. A., "Incandescent mantles for lamps." Aug. 13.

15,254.—Middleton, R. E., "Production of gases from hydrocarbon oils. Aug. 14.

15,268.—Hempel, F. W. H., and Gumpel, M., "Incandescent gas-lamps." Aug. 14.

15,310.—Shuttleworth, A. and F., and Deed, P., "Igniting the combustible charges in gas, oil, and like engines." Aug. 14.

15,315.—Le Page, J. F., "Gas-cocks." Aug. 15.

15,359.—Duke, J. F., "Combined tap, bye-pass, and automatic igniter for incandescent gas-lamps." Aug. 15.

15,360.—Willson, T. L., "Production of calcium carbide." Aug. 15.

15,366.—M'Ewen, T. G., "Manufacture of gas." Aug. 15.

15,402.—Exley, J. H., "Generating acetylene gas." Aug. 16.

15,423.—Hancock, D., Craig, J. B., and Hancock, A. H., "Atmospheric gas-burners for incandescent lighting." Aug. 16.

15,430.—Thomas, W. J., "Gas-lamp." Aug. 16.

15,456.—Bueb, J., "Preventing gas conduits from being stopped by deposits caused by frost." Aug. 16.

15,469.—Glover, R. T. and J. G., "Increasing the heating power of atmospheric burners (gas), and increasing the luminosity of incandescent mantles, canopies, or like bodies." Aug. 16.

15,512.—Robinson, S. H., "Gas-burners." Aug. 17.

15,521.—Horton, G. A., "Supplying steam, water, or other fluid to the cups of telescopic gasholders." Aug. 17.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Thursday, Aug. 22.

THE SUPPLY OF WATER IN LONDON.

Mr. J. Stuart had upon the paper three questions to the "President of the Board of Trade" on the supply of water in London. He asked, first, with reference to the fact that the reports of the Official Water Examiner for the Metropolis show that since the great frost of last winter the quantity of water sent out by the East London Company has been largely in excess of that supplied by them before the frost, and that the average quantity delivered daily during last June was upwards of 51 million gallons, whereas that supplied during June in each of the two preceding years was only 43 million gallons, whether any facts have been furnished by the Water Examiner or by the Company to account for this great increase. He next desired to know the number of days' supply represented by the capacity of the storage reservoirs for unfiltered water belonging to the East London Water Company and to each of the other London Water Companies. The third question on the paper was whether the "President of the Board of Trade" would lay upon the table of the House a return showing the average quantity of water supplied daily by the East London Company from various sources in each month during the past two years; and whether he would, in future, present to the House the monthly reports of the Water Examiner as to the quantity and quality of the water supplied by each of the London Water Companies.

Mr. Chaplin: I am informed by the East London Water Company that the increase in the quantity of water supplied during the month of June last, as compared with the supply during the corresponding month in the two preceding years, is due (1) to an increase of 36,000 in the population since 1893; (2) to the fact that a large number of pipes belonging to the consumers were burst—50,000 of such fractured pipes having been found between April 20 and June 29—and that in many instances the necessary repairs have not yet been carried out; and (3) to the abnormally dry weather of May and June, when garden watering was a source of great waste. The Engineer of the Company states that all pipes belonging to the Company within the County of London which were damaged by frost or otherwise were replaced or made good by April 8. I have communicated with Major-General Scott, the Water Examiner under the Metropolis Water Act; and he informs me that he has no information which would lead him to doubt the accuracy of the statements of the Company in this matter. In answer to the second question, I have made careful inquiries of the several Water Companies as to the number of days' supply represented by the capacity of their storage reservoirs for unfiltered water. The effect of the replies is as follows: East London Water Company, an average of about 17 days' supply of Lea water; West Middlesex Company, 6½ days' supply; Grand Junction Company, 3½ days' supply; New River Company, 4 or 5 days' average supply; Southwark and Vauxhall Company, 4 days' supply; Chelsea Company, 13½ days' supply. With regard to the third question, I am quite willing to lay upon the table of the House a return showing the average quantity of water supplied daily by the East London Water Company from various sources in each month during the past two years, if the hon. member will move for it. As to the monthly reports of the Water Examiner, they are furnished by the Local Government Board to the London County Council and to all the sanitary authorities in the Metropolis; and they are also placed on sale. It is hardly necessary to lay these reports upon the table of the House; but if any member would desire to be furnished with copies, and will inform me of his wish, I will arrange that they shall be regularly supplied to him.

Friday, Aug. 23.

LONDON WATER COMPANIES' SUPPLY.

On the motion of Mr. J. Stuart, a return was ordered, "showing the average amount of water supplied daily by each of the London Water Companies, from various sources, in each month during the past two years; specifying the amount from each source separately."

The Gas Orders Confirmation Bill and the Gas and Water Orders Confirmation Bill, having been considered by the Committee on Unopposed Provisional Order Bills, in accordance with a resolution of the House, were last Wednesday reported without amendment, read the third time, passed, and returned to the Lords.

LEGAL INTELLIGENCE.

DOVER QUARTER SESSIONS.—Monday, Aug. 12.

(*Before Mr.* H. B. Poland, *Q.C., the Recorder.*)

The Assessment of the Broadstairs Gas-Works.

This was an appeal by the Broadstairs Gas Company against the assessment of their works, mains, &c., by the Assessment Committee of the Isle of Thanet Union and the Overseers for the parish of St. Peter's, Isle of Thanet.

Mr. Littler, Q.C., Mr. Ryde, and Mr. Weigall appeared for the appellants; Mr. Balfour Browne, Q.C., Mr. Page, and Mr Hohler, for the respondents. The professional witnesses present for the Company were Mr. W. Marshall and Mr. H. E. Jones; and for the Guardians, Mr. C. F. Jones, F.S.I. (the Union rating valuer), Mr. W. Eve, F.S.I., Mr. W. A. Mason, F.S.I., and Mr. W. R. Chester.

The appeal was against a rate which was originally fixed on the property of the Company at £1567 gross and £1027 rateable, and which was reduced by the Assessment Committee to £1490 gross and £900 rateable. The old assessment was £580 gross and £460 rateable, which had been standing since 1880.

Mr. LITTLER, in opening the case, admitted that there had been undoubtedly a considerable increase in the sale of gas; but notwithstanding that, he felt sure he could establish that there had been very little increase in the rateable value. This argument he founded on the fact that the Company in their present buildings were completely crowded out, and that their plant and appliances were being worked to their utmost. Although they had been unsuccessful in an application for a Provisional Order to extend the works, it would be essential in the immediate future; and in considering the balance-sheet of the Company, it was necessary to look at the amount that would have to be spent in a very short time. Counsel then handed the Recorder a balance-sheet, pointing out all the considerations which he urged should be taken into account in making an assessment.

After the mid-day adjournment,

The RECORDER suggested that an attempt might be made to come to an amicable settlement, so as to save expenses, as it was understood that otherwise the case would occupy at least two days.

Considerable discussion ensued, which ended in an arrangement being arrived at to the effect that the rateable value should be lowered from £900 to £775; that the appellants were to contribute £210 towards the respondents' costs; and that, as far as the latter can promise, they will not disturb this arrangement for five years from this hearing.

The RECORDER remarked that he considered the matter had been settled very fairly.

The Welsbach Patents before the Brussels Courts.

The Welsbach patents have lately been before the Brussels Courts in an action brought by the Société Belge d'Incandescence Auer against the Société Nouvelle d'Eclairage and two other defendants. It appears that a burner made by the latter, and exhibited in a shop-window in the city, had been seized, as being an alleged infringement of the plaintiffs' patents. The defendants denied that there had been any infringement, inasmuch as the Welsbach system had been anticipated: (1) By the publication of an article relating to the "lunar" and "solar" lamps of Frankenstein, published in 1848 by the *Leipziger Tageblatt*; (2) by an invention of Werner relating to the same appliances, which was the subject of a communication to the Polytechnic Society of Leipzig on the 3rd of March, 1848; (3) by a Belgian patent taken out by M. Clamond on May 23, 1880, and by his subsequent patents of June 20, 1882, and June 20 and Dec. 7, 1883; and (4) by the French and English patents of Williams, of Jan. 16, 1882. The comparison of these documents with the Welsbach patents involved technical questions which the Court could not settle without the assistance of experts. The defendants contended that it is impossible, following the specifications, to produce the Welsbach burner as it is now offered to the public as an article of commerce; and that the solution of the oxides of rare earths in which the mantles are steeped is really a trade secret. They maintained that this solution is the essential element of the invention, inasmuch as it is eventually to become the incandescent body; that its composition enters directly into the process of manufacture claimed by Dr. Auer von Welsbach; and that there would be obscurity in the description of the method of manufacture if, by the aid of the directions contained in the specification, competent people could not succeed in composing the impregnating liquid so as to obtain a light, if not equal, at least nearly similar, to that afforded by the Welsbach burner as sold—the intensity and quality of the light being dependent upon the skill of the maker and upon the purity of the metals or rare earths employed. In order to clear up all these matters, which, as stated above, involved technical questions necessitating experiments, it was thought that assistance should be sought from experts, who would be able to determine whether or not the burners produced by the defendants were, in fact, infringements of the Welsbach patents. The Court considered that the impregnating solution was not a subject of patent, and that anybody is at liberty to make the liquid by means of the materials indicated in the specifications, which are already articles of commerce, and by the processes described therein. But before pronouncing upon the principal demand of the plaintiffs, the Court submitted to three experts—viz., MM. Bruylants, Rousseau, and Wauters—the following points: (1) Are the productions of Frankenstein, Werner, Clamond, and Williams, taken in their entirety, anticipations of the Welsbach patents? (2) Is it possible to obtain, in a satisfactory manner, the commercial result claimed in the Welsbach patents, by making an impregnating liquid by a mixture of the substances therein indicated, in whatever proportions, or by a combination of these substances in the proportions determined in those specifications? (3) Is the seized article constituted of the same materials and made according to the same processes as those mentioned in the Welsbach patents? The result of the litigation was that the plaintiffs were ordered to restore the burner, and to pay the defendants 500 frs. damages and costs.

The Suggested Extensions at the Hinckley Gas-Works.—With reference to the article on the above subject which appeared in the JOURNAL on the 13th inst. (p. 351), in which some extracts were given from a report by Mr. G. Helps, the Gas Engineer and Manager of the Hinckley District Council, showing the urgent need for improvement; we learn that the Chairman and members of the Gas Committee are quite agreed as to the necessity for the extensions proposed, and some 16 months ago application was made to the Local Government Board for further borrowing powers; but they were not granted.

Blackburn Gas and Water Supply.—The Borough Treasurer of Blackburn has issued his statement of accounts for the year ending the 25th of March last. They show an expenditure of £59,879 on the gas account; the receipts exceeding this sum by £37,057. Interest and the payment into the sinking fund, &c., amounted to £26,394; leaving a balance of £10,663 to be carried to the reserve fund. The water-works account shows a loss on the year's working of £4145. The gross liabilities of the Corporation on the 25th of March were £2,229,198, of which sum only £637,778 is unproductive. The rateable value of the borough increased from £330,782 in 1885-6 to £441,590 in 1895.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

Reduction in Price.

The Annual General Meeting of this Company was held last Tuesday—Mr. E. LAWRENCE, J.P., in the chair.

The SECRETARY (Mr. P. F. Garnett) having read the notice convening the meeting, the report of the Directors, with the accounts for the year ending June 30, was presented. It stated that the total revenue amounted during that period to £581,982, and the expenditure to £445,916; leaving a surplus of £136,066, which had been transferred to the profit and loss account. After deducting the amount taken for the payment of the dividend declared last February, and the interest on the bond and debenture debt, there remained a balance of £72,362, out of which the Directors recommended a dividend for the past half year of 5 per cent. on the ordinary consolidated stock, and 3½ per cent. on the 7 per cent. stock. The Directors expressed their pleasure in being able to announce that the prospects of the Company for the current year justified a further reduction in price to 2s. 10d. per 1000 cubic feet, to take effect from the end of last quarter.

The CHAIRMAN, in moving the adoption of the report, said he ventured to hope the accounts would be deemed satisfactory. The capital expenditure, so far as new works were concerned, was now coming to an end; and he trusted it would be a long time before any further outlay of the kind would be required. As to the revenue account, the main point on the expenditure side was the great saving in the cost of coal carbonized, which amounted to nearly £60,000. This, of course, was largely due to the fact that during the previous year the Company were compelled, by the coal strike, to pay a very heavy price for coals. Otherwise the expenditure was much the same as in previous years; the total being £445,916, as against £509,140. On the other side of the account, there was the same disturbance of calculation arising from the additional price of coal in the former year. In spite of an increased consumption, the total amount received for gas from all sources was £475,185, as compared with £503,287. During the past year, the gas sold to private consumers showed an increase of about 1¼ per cent.; that consumed by automatic meters, an advance of 27 per cent.; while on the gas sold to the Corporation there was a decrease of 11 per cent., which, of course, was owing to the action of the Corporation in reducing the light given to the city. The total result was that the sales of gas came to 1 per cent. in excess of what they were in the previous year; and when the shareholders considered that the electric light went on making steady progress in the town, he thought they would come to the conclusion that the result as regarded the Company was very satisfactory. The estimates for the coming year, which were based on a lower scale of prices for coal, warranted the Directors in proposing a reduction of 2d. per 1000 cubic feet in the price of gas. At one time, he hoped there would be a larger amount available; but, unfortunately, the prices of the residual products had fallen off as regarded coke and ammoniacal liquor. He hoped, however, that, with the reduction of 2d. per 1000 cubic feet, they would be able to pay their way satisfactorily, and that the public would feel the Directors were doing all in their power to supply gas at the lowest possible figure. There had been complaints about the gas made at Garston; but, in reality, it was of very fine quality. No doubt its specific gravity differed materially from that of the ordinary gas; and the ordinary burners were not quite adapted to it. The Directors were doing everything they could to remedy any defects, by putting in fresh burners; and as far as his knowledge went, in the great majority of cases where this had been done, people had expressed themselves as perfectly satisfied. The public and the shareholders might rest perfectly assured that the gas was good, and that the working of the new concern at Garston had been singularly satisfactory. When they last met, he was able to tell them that their troubles with the Corporation had practically been brought to a close; and that one point—the question of price in the future—had been left open for amicable consideration. He was glad to say that this matter had been settled without any trouble. They felt it was not wise that two public bodies should be brought into conflict by wrangling over the small amount involved in the allowance the Corporation wanted; and therefore they agreed to make an abatement to them, from which the Company in no way suffered. There were one or two other questions the Corporation had opened; and he hoped the Directors would be able to settle them as pleasantly as they had done in the other case. He, however, would just like to say that he did not think it was calculated to facilitate the settlement of questions in dispute for the Chairman of the Lighting Committee to say, as he did at the last meeting of the Council, when they were striving to work amicably together, and to do the best they could for the welfare of the town and its inhabitants, that the Company were paralyzing the industry of Liverpool. Such remarks did not tend to promote the friendly spirit they were all trying to foster. The Corporation had asked for certain information as to the price at which an inferior quality of gas could be supplied. Without in any way passing an opinion on the question of the reduction of the quality, they were endeavouring to prepare the information required. The question was a serious one, and deserved attention; but what the outcome of it might be it was impossible to forecast. At all events, the Corporation would be approached by the Company, and he hoped the Corporation would approach them, in a fair and reasonable spirit. The Corporation had lately made a new start. They had purchased the electric lighting undertaking; and therefore one might expect in due course that, so far as the Corporation were concerned, gas would be superseded by electric light. But he was very doubtful whether the Corporation would be able to persuade the public to take the more expensive illuminant, any better than the Electric Lighting Company had done. At all events, he could see nothing to make the shareholders feel that the property of the Company was not as good as it had always been. They might depend upon it that everything would be done by their officials to keep down the expenditure, and manufacture gas at the lowest possible price; and

he believed that, on these conditions, they would be able to hold their own in the future as they had done for so long in the past.

Mr. H. B. GILMOUR seconded the motion, and it was adopted.

The dividends recommended having been declared,

Sir T. Earle, Bart., Mr. D. Owen Bateson, Mr. Malcolm Guthrie, and Mr. G. Holt were re-elected Directors of the Company; and Mr. J. R. Darsie was again appointed Auditor.

The proceedings concluded with a hearty vote of thanks to the Chairman for presiding.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Albion Tavern, Aldersgate Street, E.C., on Friday last—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) having read the notice convening the meeting, the report and accounts, the principal features of which were given in the JOURNAL last week, were presented.

The CHAIRMAN moved—"That the report of the Directors and the accounts be received, adopted, and the report entered upon the minutes." He said the Company were in the happy state at that moment of having no history, excepting one of uniform and satisfactory progress. There was an unusual increase in the demand for gas in the past half year; but this was due to a large extent to the severe frost during the first two or three months. Beyond that, he was happy to say the increase had still been maintained. During the first quarter, it was a very excessive rate of increase—something like 17 or 18 per cent. But during the second quarter, when there was no frost, and nothing unusual to cause an augmentation of consumption, it was at the rate of about 9 per cent.; and in the past month (July) it had been at the rate of 10 per cent. So that it indicated, at any rate, that there was vitality in the Company's business, and that they might still look forward to a considerable increase. Speaking of increase, he was reminded that during the last ten years the business of the Company had grown to the extent of more than 60 per cent. Comparing the June half year of 1885 with the past half year, the increase was at the rate of 63½ per cent., which might be taken at something like 6 per cent. per annum. This was so far satisfactory; but there was another side which was not so satisfactory as one could wish. The increase in the consumption of gas had enabled the Company to meet the very considerable fall in the value of coke and ammonia. Coke, which in the June half of 1894 brought them in 7s. 4d. per ton of coal used, in the half year just terminated only returned 5s. 6d. per ton of coal; showing on this item a very serious loss indeed—viz., as much as 1s. 10d. per ton, which was equal to 2d. per 1000 cubic feet of gas sold. This, of course, they could not help. They sold the coke as it was made, and according to the market demand. When the market called for it, they reduced the price; and probably the fall in the price of coke was due to the fall in the price of coal. Last year, coal was somewhat dearer; and, as far as gas coal was concerned, the price was artificially maintained or increased by a combination of coalowners. This, as the report stated, collapsed this year; and the result had been that gas coal had returned to about its normal figure, which was a little over 6s. per ton, free on board. But there was another matter which was quite as serious, and more unaccountable—viz., the question of ammonia. The accounts for the past half year did not show the drop in ammonia to its full extent. Last year they sold sulphate in the middle of the year at £13 15s. per ton, or (say) £13 10s.; and now one could not get £9 10s. for it—showing a drop of about 30 per cent. Of course, one tried to ascertain what was the cause of these fluctuations, which were very serious to gas-makers and consumers; for the fall in ammonia, coupled with the fall in coke, amounted to something approaching 3d. per 1000 cubic feet on the price of gas. Sulphate of ammonia was used exclusively for agricultural purposes; and it was mainly exported—being in great demand for growing sugar beet. If the sulphate made in any given year was not sold, it remained in stock, only to glut the market for the succeeding year; and thus all the sulphate that was sold year by year was used and got rid of. Unfortunately, last year, when the price was so good, there were some people who wanted to make it better, and refused £13 15s. a ton—saying they would only sell at £14. The result was there were no buyers at £14, and large stocks accumulated, which ultimately had to be sold at £13. They then stood out for that price; and though it was sold for £13 in October, in December again large stocks accumulated, and had to be disposed of for £11 per ton. Now the figure had gone down to £9 10s. These low prices were due to the fact that buyers knew there were large accumulated stocks; and as they knew they must be put on the market sooner or later, they were refusing to give anything but this absurdly low price—the lowest he had ever known—and he did not think that there was much probability of improvement until these stocks had been got rid of for what they would fetch. The fall in the price of coke and sulphate made it difficult to reduce the price of gas; but the Directors were in a position, as was stated in the report, owing to the lower cost of coal, and some savings they hoped to make in manufacture, to announce a reduction of 1d. in the price of gas from the June quarter. This Company, acting under the enlightened guidance of the gentleman who for many years was its Deputy-Chairman (the late Mr. H. P. Stephenson), had adopted the principle in 1863 of making reductions of 1d. a time; and he had the curiosity the other day to add up the reductions which had taken place since 1859. He found that in 36 years, they had reduced the price 33 times. In 1859, the price was 5s. 6d., while it was now 2s. 7d.; and in all those years the price had only been raised once—in 1892, when it was increased from 2s. 6d. to 2s. 9d. per 1000 cubic feet. They had now got back to 2s. 7d., and were very anxious indeed to reach 2s. 6d. again, at which figure the price stood before the last increase. It was satisfactory also to report that the demand for gas still continued on the automatic supply system. As most of the proprietors were aware, working-people and weekly tenants were unable or unwilling to pay the cost of fitting up their houses with gas, and found it a difficult matter to pay a quarter's gas bill; but if the gas could be put into their houses without their being called upon to pay the cost in a lump sum, and if they were able to pay for the gas consumed in small amounts, they were very willing and anxious to obtain it. The system they had adopted was to put fittings into the houses and fix meters without charge to the weekly tenant or the consumer (rent of meter and fittings being charged in the price of gas); and then when he wanted a supply of gas, he had only to put a penny into the meter, and that would allow the meter to pass about 25 cubic feet of gas. Or 5d. or 6d. might be put in at once; and then five or six pennyworth of gas was supplied. When notice was given by the gradual dropping of the light, the consumer put in a few more pennies, and the meter went on again. A year ago, they had 1100 of these automatic meters; at Christmas, they had 1700 odd; and on the 30th of June, they had 2316 meters. In the last fortnight, the Engineer reported that 72 additional meters had been laid on. This method was beneficial in two ways. The Company got the profit on the increased sale of gas, which helped them to sell gas cheaper; and they were also conferring a benefit on the working classes of the district. He might mention that they were progressing in another way. Whereas ten years ago it took rather over 10d. per 1000 cubic feet to pay interest on capital, it now required 8½d. to pay a little higher interest. They were paying a rather higher dividend—5¼ per cent., as against 5 per cent.—and it now took 8½d. per 1000 cubic feet, as against 10d. They were looking forward to the time when, by an increase in business, the relative amount of capital should be further increased, and when they would be able to pay a full dividend at a smaller charge than 8½d. per 1000 cubic feet, though this was considerably less than was often required by gas companies. He did not know that there was anything further he need remark upon. He thought it would be very interesting to the shareholders to know that the officers and workmen had now the opportunity of depositing their savings and annual bonus with the Company at 4 per cent. interest; and that they had availed themselves of the privilege in the course of the year to the extent of £4100. This was evidence of thrift on the part of the employees, and also evidence of their confidence in their employers. He had much pleasure in moving the resolution, as he considered the report would be satisfactory to the shareholders.

The DEPUTY-CHAIRMAN (Mr. F. Lane Linging) seconded the motion, which was carried unanimously.

The CHAIRMAN then moved—"That a dividend for the half year ended June 30 last, be now declared at the following rates per annum—viz., 5 per cent. on the preference stock, and 5¼ per cent. on the ordinary stock, less income-tax; and that the warrants for the net amounts be forwarded on the 30th inst., to the registered addresses of the proprietors, by post."

Dr. FREDERICK HETLEY seconded the resolution, which was carried unanimously.

The CHAIRMAN then moved—"That the salary of the Secretary be increased by £50 per annum, from Jan. 1 last." He explained that the Directors always considered the question of salaries in the early part of the year, though they did not increase them every year; and as it was determined to recommend an increase in the Secretary's salary, they thought it would be rather hard upon him, seeing that they had to get the consent of the shareholders, to put him in a worse position than he would otherwise have been in. It was, therefore, recommended that whatever was done should date from January 1. Mr. Ohren had now been Secretary for two years. He was an officer who was thoroughly devoted to the Company's interests, and most anxious to promote its prosperity, as his father had been before him. He had, therefore, great pleasure in proposing this resolution.

The DEPUTY-CHAIRMAN, in seconding the motion, endorsed what the Chairman had said. When the question came up some two or three years ago of a successor to the late Secretary, the Directors very properly took great care before filling up the vacancy. He had seen Mr. Ohren during a number of years—having been a Director of the Company for now 33 years—and he saw how well he worked, and how he devoted himself to the business; and he felt sure that if the Directors placed their confidence in him, they would be doing the right thing. He had only to say that he had realized everything that was expected of him, and thoroughly deserved the recognition proposed to be given him.

The resolution was carried unanimously.

Mr. C. M. OHREN thanked the Board and the shareholders for the practical manner in which they had shown their appreciation of the way he had carried out his duties. It was most encouraging to anyone who endeavoured to do his duty in a satisfactory manner to receive such recognition; and he could assure them that all the officers, both under their most able Engineer and himself, did their utmost to gain the esteem of those in authority.

Mr. H. J. ROBUS proposed a vote of thanks to the Chairman and the Directors for their services during the past half year. He was quite sure the business of the Company could not possibly be carried out in a better manner.

Mr. A. EAMES had great pleasure in seconding the resolution, and especially congratulated the Directors on the way in which they had recognized the services of the Secretary.

The resolution having been carried,

The CHAIRMAN said the Board were all deeply interested in the Company; and they were very proud to belong to it. The shareholders might rest assured that they would do their utmost to ensure its prosperity. He could not sit down without proposing a vote of thanks to the officers; for unless they had efficient, honest, and thoroughly reliable officers, the Company would not succeed. He therefore proposed a vote of thanks to Mr. Gandon and those associated with him, and to Mr. Ohren as representing the clerical staff, for their services.

The DEPUTY-CHAIRMAN seconded the motion, which was adopted.

Mr. GANDON, in acknowledging the vote of thanks, said he believed the Company had as devoted a set of officers as any company could boast of. For his own part, he took a thorough interest in the work, and hoped to see the Company succeed; and he believed that all those under him took the same interest in it.

Mr. OHREN also briefly responded on behalf of the clerical staff.

The proceedings then terminated.

BRISTOL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday—Mr. J. W. S. DIX in the chair.

The SECRETARY (Mr. John Phillips) read the notice calling the meeting; and the report, which was noticed last week in the JOURNAL, was taken as read.

The CHAIRMAN said it was a matter for congratulation that the Directors could place before the meeting such satisfactory accounts. The increase in their output was 7½ per cent., which showed that they were not much affected by their electric friends, nor had they any fear but that their prosperity would continue. They had not only earned their dividend (which placed them in a better position than some gas companies), but they had £11,300 besides. He referred to the increased earnings from stoves, and said that this department had a very satisfactory future before it. The demand for stoves went on gradually increasing; and he had no doubt that it would continue to do so. There was also another departure which it would be desirable to cultivate; and that was "slot" meters. Though the Company had been in existence for so many years, no more than 20,000 houses in their district were provided with gas. Speaking generally, the houses of the working classes were not supplied with gas; and if the Company could induce mechanics to have gas by slot meters, the advantages of gaslight would be brought home to them, and they would rapidly learn to appreciate it. In addition to what he had told them, they had carried £1000 to the reserve fund; and last, though not least, it would be pleasant to them, and to the citizens generally, to learn that the Directors had reduced the price of gas 2d. per 1000 feet, and at some future time, not very far distant, he hoped they would make a still further reduction. He moved the adoption of the report and accounts.

Mr. R. D. ROBJENT seconded the proposition. He congratulated the shareholders on the present condition of affairs.

Mr. MEDWAY, while also congratulating the Directors and the shareholders on the present condition of affairs, reminded the Board that the business, after all, was speculative. He must confess that he would rather see a further building up of the reserve fund before making too liberal concessions to the consumers. Some day they might lose their dividends.

The CHAIRMAN claimed that the Board had the best interests of the shareholders in mind when they took the present line. The policy of the Board was, of course, to guard the shareholders by a judicious increase of reserve: and, at the same time, to act liberally towards their customers. He did not think it would be well to rush up their reserve fund before doing anything for the public. The shareholders might depend upon it that the Directors would endeavour to do the right thing between the Company and the public without jeopardizing their interests.

The motion was carried unanimously.

A resolution authorizing the payment of the usual 5 per cent. dividend was then passed; and votes of thanks to the Chairman, Directors, Auditors, and other officials, terminated the proceedings.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Report and Accounts.

The Directors of the Tottenham and Edmonton Gas Company have issued their report for the half year ending June 30; and it will be submitted to the proprietors at the ordinary general meeting next Saturday. We learn therefrom that the quantity of gas sold was 16,755,300 cubic feet, or 10·57 per cent., more than in the corresponding period of 1894. The number of consumers who were using ordinary meters on June 30 was 5489; and of those using automatic meters, 1825. The demand for the supply of gas by the latter meters continues steadily to increase. The number of gas-cooking stoves fixed on rental since Dec. 31 last is 67; making the total number on rent 868. Having made favourable contracts for the supply of coal during the next two years, the Directors have been enabled to reduce the price charged to the local authorities for public lighting. This took effect from the 1st ult. They have also determined to further reduce the price of gas supplied by ordinary meter, from and after the Michaelmas quarter, by 1d. per 1000 cubic feet; making the selling price 3s. With regard to residuals, as in the case of many gas companies, the Directors have to report that the market price continues very low; that of sulphate of ammonia being exceptionally so. It is gratifying to find that the carburetting plant which has been put up at the Company's works continues to act satisfactorily; and during the severe frost in the early part of the year it proved to be of great service in meeting the increased demand for gas. The high appreciation in which the stock of the Company is held was exemplified during the past half year by the sale of the third portion of "C" stock (£20,000), which realized a net premium of £15,308, equal to £76 10s. 9d. per cent. The Company's Engineer (Mr. W. H. H. Broadberry) reports that the whole of the works, machinery, and distributing plant are in efficient condition. The balance available for division is £9069, which includes £1682 brought forward; and the Directors recommend the payment of the following dividends, less income-tax: On the "A" stock, at the rate of 11½ per cent. per annum; and on the "B" and "C" stocks, at the rate of 8½ per cent. per annum. This will absorb £7236, and leave a balance of £1833 to be carried forward.

The accounts accompanying the report show that £5044 was spent for capital purposes in the first half of this year; £1991 being for new buildings and manufacturing plant, £1612 for new mains and services, £1264 for new meters (including fixing), and £177 for new gas-stoves. This brings the total expenditure to June 30 up to £222,912, and leaves £14,198 in hand. The revenue account shows that the sale of 175,097,700 cubic feet of gas for public and private lighting, produced £27,026; rental of meters and stoves, £962; and the sale of residuals, £4046—the total receipts being £32,046. On the other side of the revenue account, the manufacture of gas is shown to have cost £16,360 (£10,300 being for coals); distribution, £2808; rents, rates, and taxes, £1609; and management, £1698—the total expenditure being £23,632, leaving a balance of £8414 to be carried to the profit and loss account. With regard to working, 9909 tons of coal and 7 tons of cannel were carbonized, and 241,122 gallons of petroleum were used for enrichment. In the manufacture of carburetted gas, 1543 tons 18 cwt. of coke were employed. Of this residual, 6393 tons 16 cwt. were made; 100 tons 18 cwt. were bought; 1092 tons 13 cwt. were in store; 2043 tons 4 cwt. were used as fuel; 5483 tons 16 cwt. were sold; and 60 tons 7 cwt. remained in store at the end of the half year. Of the other residuals, there were 1179 chaldrons of breeze, 89,367 gallons of tar, and 2754 butts (108 gallons) of ammoniacal liquor; and the production of sulphate of ammonia was 99 tons 8 cwt.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

According to the accounts to be submitted at the half-yearly general meeting of the Bath Gas Company on the 30th inst., the gas-rental for the six months ending in June amounted to £26,362. This is an advance on the corresponding period of 1894, notwithstanding a reduction of 2d. per 1000 cubic feet in the price of gas which took place in July of that year. The total receipts were £33,002; while the expenditure was £26,497—leaving £6505 to go to the net revenue account. The balance available for division is £12,788; and the Directors will recommend maximum dividends. Under the supervision of Mr. C. Stafford Ellery, there were 21,237 tons of coal carbonized in the past half year; the residuals produced being 13,787 tons of coke, 1411 tons of breeze, 1043 tons of tar, and 614,000 gallons of ammoniacal liquor—the quantity of sulphate made being 183 tons.

In the report which the Directors of the Brighton and Hove Gas Company will submit to the proprietors on the 13th prox., they state that the abnormally low temperatures which prevailed during the early part of the year had a marked effect on the rate of increase in the quantity of gas sold by the Company in the six months ending in June, which reached the high figure of 9¾ per cent. The accounts accompanying the report show a corresponding rise in revenue from this source. The sale of residuals was satisfactory, though resulting in a decrease in the amount realized as compared with the June half of 1894, which was an exceptionally good time. The sale of gas for public and private lighting—in all, 481,473,600 cubic feet—produced, at prices ranging from 2s. 11d. to 4s. 11d. per 1000 cubic feet, £71,990; rental of meters and fittings brought in £1995; residual products, £17,772; and other items made up the receipts to £91,860. The expenditure in connection with the manufacture of gas amounted to £49,546 (£32,956 being for coals); distribution expenses came to £6753; those connected with management, to £4268; and the total expenditure was £64,726—leaving a balance of £27,134. The sum available for division is £31,887; and the Directors recommend dividends at the rate of 11, 8, and 6 per cent. per annum on the three classes of the Company's stock. With regard to the works (which are under the supervision of Mr. J. Cash, M.Inst.C.E.), the Directors state that progress was made in the past half year in the construction of carburetted water-gas plant. The amount of coal carbonized was 46,218 tons. The estimated quantities of residuals produced were: Coke, 59,241 chaldrons; breeze, 2016 tons; tar, 549,391 gallons; and ammoniacal liquor, 1,002,375 gallons.

At the half-yearly meeting of the Colchester Gas Company on the 16th inst., the Directors reported that the revenue in the six months ending June 30 had been £11,982; and the expenditure, £9912—leaving a balance of £2070. The Chairman (Mr. C. Coleman), in moving the adoption of the report, said there had been a great demand for gas, both for cooking and lighting purposes; but the market for sulphate of ammonia had been the lowest anyone remembered. Tar had improved in value, and had in a measure counterbalanced the loss on ammonia; and the demand for coke was well maintained. On the whole, therefore, the financial position of the concern was much the same as in the corresponding half of 1894. The motion was carried; and resolutions authorizing the payment of a dividend at the rate of 10 per cent. per annum on the original shares, and of 7 per cent. per annum on the new shares, were passed. The meeting was then made special for the purpose of authorizing the raising of additional capital. The Chairman explained that, when the works were last enlarged, they were told that they would suffice for about twenty years. The time had now come when they must do something; for in the winter, when the retorts were all in full work, they could hardly keep up the supply. They did not want to raise the needful capital all at once, but to issue the shares as required. He concluded by proposing the necessary resolution. In answer to a question, he added that the additional capital was mainly for improving the works. They did not propose to extend the present retort-house, as this would entail great expense; but they proposed to erect plant for making water gas. The motion was carried unanimously.

The consumption of gas at Dover in the six months ending June considerably exceeded the supply in any similar period. The advance existed throughout the entire half year; and the Directors of the Dover Gas Company express, in the report they will submit to the proprietors on the 2nd prox., the belief that it arose from the extending use of gas for heating and cooking purposes—a form of increase which they say is most beneficial at the present time. They regard the results of the half-year's working as eminently satisfactory, on the whole. There is a balance of £2696; and they recommend the usual dividend at the rate of 7½ per cent. per annum—leaving a small balance to be carried forward.

The Faversham Gas Company had an increase of £149 in their receipts from the sale of gas, and of £57 in the returns for residual products, in the year ending June 30; but against this there was an additional expenditure of £286, due in a large measure to the severe weather of the past winter, which retarded the delivery of coal to the works, and necessitated the purchase of supplies wherever they could be obtained. The Directors, in their report, nevertheless consider the net result satisfactory, under the circumstances, as the gross profit for the year is only £15 less than for the previous year. The net profit,

after allowing for income-tax, is £2733 (as against £2775 13s. 7d. for 1893-4). This, with £1026 brought forward, and a small amount for interest, makes a total of £3763 available for distribution. Out of this the Directors recommended the declaration of a dividend of 9 per cent., free of income-tax, which will absorb £2419 and leave a balance of £1344 to be carried forward. During the year a reduction of 5s. per lamp was made in the charge for public lighting; and the Directors proposed to reduce the price of gas to private consumers 3d. per 1000 cubic feet, as from the 30th prox. In moving the adoption of the report at the recent annual meeting of the Company, Mr. J. A. Anderson, the Vice-Chairman (who presided in the absence of Mr. W. E. Rigden, the Chairman), said it was to be regretted that the income from gas-stoves did not increase so much at Faversham as it did in other places. This was disappointing from the shareholders' point of view; because if a larger number of stoves were used, gas would be consumed in the daytime, when they had it to spare. Alluding to the proposed reduction of 3d. per 1000 cubic feet in the price to private consumers, Mr. Anderson said the net profit this year was no more than it was in 1894. But coals were down to something like their normal price; and the Directors were glad to be able to make the reduction, which was in a measure promised a year ago. It was a liberal one; and he hoped the consumers would appreciate it. The motion was carried, and the dividend recommended declared.

The accounts presented at the annual general meeting of the Maidstone Gas Company on the 15th inst. showed a balance of £13,077; and the Directors recommended the payment of a dividend, less income-tax, at the rate of 11 per cent. per annum for the six months ending June 30. They reported an increase in the Company's business; and stated that the works and plant (under the able management of Mr. H. Smythe) had been kept in good condition. In moving the adoption of the report, the Chairman (Mr. Ambrose Warde) remarked that there had been an increase to the extent of 11 per cent. in the consumption of gas, which was considerable. With regard to figures, the balance of the profit and loss account in favour of the Company was £13,077; and out of this the Directors recommended a dividend of 6 per cent. for the past half year—making 11 per cent. for the year. This would absorb something like £4400—leaving £8600 to be carried forward; so that they had another year's dividend of 11 per cent. at present in hand. The reduction of 1d. per 1000 cubic feet in the price of gas had cost £1000 a year, of which the consumers received more than 80 per cent., and the shareholders the rest. The cost of coal for the coming year would be about £1000 less than last year; and this was a very good thing in their favour. The residuals were not quite so good as usual; they had repaid about 76 per cent. of the cost of coal, as against 85 per cent. last year. The difference was to be attributed chiefly to the falling off in the price of sulphate of ammonia, which was at present very low. But the capital of the Company was also low, the amount per ton of coal being £5 1s. 10d. Altogether the concern was in a very favourable position. The works were in a good state; and they looked like living, he thought, for many years to come. The report was adopted; and the dividend recommended was subsequently declared. The remuneration of the Directors was increased by £100 per annum.

The revenue of the Ryde Gas Company from the sale of gas in the year ending June 30, as shown by the accounts presented at the annual general meeting on the 15th inst., was £9510; meter-rental produced £271; and the sale of residuals, £2529—rents to the amount of £42 making up a total of £12,352. The outlay in connection with the manufacture of gas was £6052; with distribution, £366; and with management, £703—the total expenditure being £7980. The balance carried to the profit and loss account was £4372. The balance applicable for division was £2387, out of which the Directors recommended a dividend (including the half-year's dividend already paid) of the full statutory amount of £1 2s. 6d. per share on the original shares, and 7 per cent. per annum on the ordinary shares, less income-tax. With regard to the works (which, as mentioned in the JOURNAL last week, have been placed under the management of Mr. F. F. Farrand, in succession to the late Mr. G. Garnett), the new gasholder, completed towards the close of last year, has considerably increased the distributing power of the works; and larger mains have been put down in several streets. Improvements are now being made in the retort-house. In the past financial year, the quantity of coal carbonized was 6399 tons. The production of gas is not given; but the residuals are estimated as follows: Coke, 3838 tons; breeze, 593 chaldrons; tar, 70,911 gallons; and ammoniacal liquor, 146,690 gallons.

The annual meeting of the Salisbury Gas Company was held last Wednesday—Mr. G. Fullford in the chair. In their report, the Directors stated that the net profit for the year ending June 30 was £2813. The interim dividend paid in February absorbed £1260; and the remainder, added to £65 brought forward, made a sum of £1618 available for distribution. The payment of the usual dividends was recommended. Regret was expressed at the decease of Mr. T. Hardick, who had been associated with the management of the Company for about 33 years; and the appointment of Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S., as his successor was announced. The Chairman, in moving the adoption of the report, said there had been an increased sale of gas to the amount of £681; but the returns from residuals were less by £430, partly due to coke following the reduced price of coal, and partly to the very unsatisfactory condition of the sulphate of ammonia market. He regarded the progress in the demand for gas as a satisfactory feature, and said that the Directors welcomed the introduction of incandescent burners or anything else that would improve the value obtainable from the gas consumed. They had decided to reduce the price of gas, as from the 1st ult., by 1d. per 1000 cubic feet, to the private consumers; bringing it down to 3s. 3d. With regard to the public lighting, this was fixed at a special low rate some time ago; and in some years it had really been an actual loss to the Company. As it was now practically at cost price, they could not reduce it further. He next referred to the death of Mr. Hardick, who, he said, was largely concerned in bringing about the present prosperous condition of the Company. After alluding at some length to Mr. Hardick's connection with the Company, he said that they had appointed to the vacant office Mr. N. H. Humphrys, who had been Sub-Manager for twelve years, and the Directors were thoroughly satisfied with their choice. Mr. S. Griffin, in seconding the motion, said he wished to join in deploring the loss of their late Manager, and to add his tribute to the skill and ability of the present one. It was no small thing to take on the management of the undertaking at short notice, just at the end of the financial year, and yet show everything in perfect order. The motion was carried unanimously. Mr. H. B. Wells proposed a vote of thanks to the Chairman and Directors; also to the Secretary (Mr. A. Whitehead), Manager, and other officers of the Company, for their attention to the business during the past year. Mr. Fisher seconded the motion, and it was carried. The Chairman having briefly replied, Mr. Humphrys, in acknowledging the vote, said he could not forget the good old friend who had discharged the duties of Manager for so many years. In his decease, the whole of the staff felt they had lost, not an employer, but a kind and sympathetic friend. With regard to himself, he highly appreciated the kindly remarks that had been made; and they would encourage him to do his best, in the more onerous position in which he was now placed. He added that the whole of the staff were united, and working in harmony to do all they could for the Company.

The Sheffield United Gas Company will hold their 81st half-yearly meeting on the 10th prox., on which occasion the Directors will present a satisfactory report on the working of the undertaking in the six months ending June 30. The receipts for gas amounted to £99,327; and though this is a falling off of £2826, there was really an increased sale to the extent of 8¾ per cent. as compared with the half year ending June 30, 1894—the reduced income being due to the price of gas being 3d. per 1000 cubic feet lower than it was during that period. The total receipts were £141,953; the expenditure being £100,966—leaving a balance of £40,987. The amount available for division is £40,653; and the Directors recommend the payment of the maximum dividends on the various stocks and shares. These will amount to £38,263; leaving a balance of £2390 to be carried forward. In the works, under the supervision of Mr. Fletcher W. Stevenson, M.Inst.C.E., 79,237 tons of coal and 17,727 tons of cannel were carbonized in the past half year. The estimated quantities of products are given as follows: Coke and breeze, 58,386 tons; tar, 6248 tons; and ammoniacal liquor, 3,060,000 gallons.

The 53rd half-yearly general meeting of the shareholders of the Waltham Abbey and Cheshunt Gas Company was held last Friday at Waltham Cross, under the presidency of Mr. Alfred Kitt (a Director), in the absence of the Chairman, Mr. Corbet Woodall. The Directors, in their report, stated that after writing off £300 from the suspense account, there was a balance of undivided profits amounting to £1884, from which they recommended the payment of a dividend at the rate of 7 per cent. on the "A" shares, and 5 per cent. on the "B" and "C" shares (less income-tax). In moving the adoption of the report, the Chairman said he considered it to be very satisfactory. The improvement in the half-year's revenue was due partly to increased sales of gas, and partly to better manufacturing results, and reduction of waste consequent on the recent works of reconstruction. The improvements at the works were completed. The penny-in-the-slot meters had been favourably received; and the number supplied was on the increase. The report was adopted without comment. The Directors, the Manager, (Mr. W. B. Randall), and the Secretary (Mr. H. Gough) were thanked for their services.

In moving, at the recent half-yearly meeting of the Weymouth Consumers' Gas Company, the adoption of the report of the Directors, the principal features in which, and in the accounts accompanying it, were noticed in the JOURNAL on the 13th inst., the Chairman (Mr. R. Thomas) referred to the approaching completion of the Company's new holder, which, he said, would enable them to supply all anticipated demands. It had cost £3000, part of which would have to be paid out of capital. To meet this payment, they had made liberal terms with their bankers for the accommodation required prior to raising additional capital. If they had to apply to Parliament, they would seek for powers, perhaps to include the lighting of Broadwey, Upwey, and Preston, so that if the borough extended in these districts the Company would have the right to go there, and prevent any other company from trespassing upon them. It was now 27 years since they were authorized to raise additional capital; and during this time fresh mains had to be laid. He thought their Manager (Mr. J. Lowe) had been most careful in watching these matters. The report was adopted; and maximum dividends were declared.

Water Companies.

The Engineer and Manager of the Cambridge Water Company (Mr. W. W. Gray) reported, at the last half-yearly meeting, that in the six months ending June 30 water had been laid on to 100 houses, the increased rental derivable from which was £187 per annum. The total number of premises now supplied is 13,803. The Directors recommended dividends at the rates of 10 and 7 per cent. per annum, less income-tax; but, to pay them, the sum of £253 would be taken from the balance brought forward. Both reports were adopted.

The annual meeting of the Sevenoaks Water Company was held on the 19th inst., when the Directors reported an improvement in the water revenue during the six months ending June 30, compared with the corresponding period of last year. But, of course, the severe and protracted frost in February and March last caused much injury to the Company's plant; and this has greatly increased the expenditure under the heading of repairs and renewals. It is estimated that a further outlay of about £100 will be required during the current six months, before the whole of the damage caused by the frost has been repaired. The balance available for distribution was £965 12s. 2d., *plus* £100 transferred from the reserve fund. This enabled the Board to recommend the usual dividend at the rate of 8 per cent. per annum on the consolidated stock, and £5 12s. per cent. per annum on the share capital, free of income-tax. This would absorb £1025, and leave a balance of £40 12s. 2d. to be carried forward.

The 35th ordinary general meeting of the Wrexham Water Company was held on the 13th inst.—Mr. W. Overton in the chair. In their report, the Directors stated that £4238 had been spent on capital account during the year ending in June; this outlay having been incurred in laying a 12-inch main from the Packsaddle reservoir to Wrexham. The receipts on water and fittings account amounted to

£147 more than in the preceding year; and water had been laid on to 167 additional houses—bringing up the number to 4588. The balance on the net revenue account was £2550; and the Directors recommended a dividend at the rate of 5½ per cent. per annum upon the consolidated stock, free of income-tax. In moving the adoption of the report, the Chairman referred to the increase which had taken place in the revenue. He said that from 1875 to 1880 it was £1250; from 1880 to 1885, £1200; from 1885 to 1890, £1200; and from 1890 to 1895, £1200. Taking the accounts altogether, and excluding the heavy charges due to the frost, the result of the past year's operations had been fairly satisfactory. The dividend proposed had been more than earned; and seeing that sufficient balances remained, the Directors recommended that the whole of the extraordinary charges should be written off, and the dividend recommended paid. The report was adopted; and the Directors were empowered to call up the remainder of the unissued capital.

GAS PROPELLED ROAD-CARRIAGES.

Our contemporary, the *Engineer*, in last week's number, published the following: "We have offered for competition prizes to the value of One Thousand Guineas for self-propelled road-carriages, believing, as we do, that the construction of such carriages may very well constitute a new branch of manufacture at least as important as that of cycles, which in a very few years has attained to enormous proportions. But it is obvious that unless the use of vehicles propelled by steam, oil, gas, or electricity is sanctioned by the Legislature, no progress can be made in this direction. It will be remembered that an alteration in the existing Highways (Locomotives) Act was prepared and met with favour in the late Parliament, and would probably have become law but for the dissolution. It is most desirable that the existence of a demand for such a change should be brought to the notice of the new Government; and to that end we have prepared the subjoined memorial, a copy of which lies at our office for signatures. . . . . Energetic action at the present moment will be of far more value than at a subsequent period, when Parliament becomes engrossed with matters which, however important for the nation in general, have scant interest by comparison for engineers."

To the Right Honourable HENRY CHAPLIN, M.P.,
President of the Local Government Board.
The Memorial of the undersigned Engineers, Manufacturers, and Employers of Labour in Great Britain,
Showeth as follows—

Towards the close of the last Parliament the late Government introduced a Bill for the repeal of existing statutes, so far as they operate to prevent the use of light vehicles propelled by steam, or other motive power, not employed in traction. The Bill was read a first time; but, by reason of the dissolution, did not proceed further.

Your memorialists believe that the time has now come when such a measure should be passed into law. They point to France for an example of the use that is made of motive power upon roads; and they respectfully urge that this country should not be in a less favourable position.

The fact that there is no opening for the use of light road carriages in this country by reason of restrictive statutes, operates to prevent the development of a trade in such articles in competition with other countries where such restrictions do not exist.

The passing of such a measure as that introduced during the last session of Parliament would lead to a large development of trade and to the benefit of a large section of the operative classes of the country.

Your memorialists therefore pray that you will take the question into consideration, and that the Bill introduced by the President of the Local Government Board under the late Government, or some other Bill to the like effect, may be presented to Parliament with the least possible delay.

THE SELECT COMMITTEE ON WEIGHTS AND MEASURES.

As Affecting the Gas Industry.

A few weeks since (see *ante*, pp. 73, 86), it was intimated in the JOURNAL that the Select Committee appointed to inquire into the subject of British weights and measures had agreed on their report—recommending immediate legislation so as to provide for the introduction of the decimal system in this country compulsorily after the lapse of a certain number of years. The evidence taken by the Committee has now been issued as a blue-book; and it forms a mass of very interesting reading. As affecting the gas industry, very little specific evidence was given; though all of it bears more or less on the possibility of usefully altering the unit of value by which gas, coal, &c., are now sold in most English-speaking countries.

The most direct evidence was given on May 14 by Mr. W. T. Rowlett, a member of the Gas Committee of the Leicester Corporation, in reply to questions addressed to him by Mr. James Stevenson. The questions and answers are given thus in the Minutes of Proceedings:

How would you deal with the gas-works, who have by Act of Parliament their price fixed at so much per 1000 cubic feet?—I should figure it out by the cubic metre.

Then you would have to alter the price in all the Acts of Parliament?—Any Act of Parliament which would make the use of the metric system compulsory would contain all the necessary stipulations for things of that kind.

Would the gas companies have to alter their gas-meters?—That is a question which has never come before me, and which I have never thought of; it is very likely they would.

Then gas-supply pipes are all made by inches and fractions of an inch—half-an-inch, three-eighths, and so on. Would this be illegal after the introduction of the metric system; would it be illegal to order so many feet of half-inch gas-pipes at so much a foot?—There is no doubt there would be some friction there; but as other countries have been able to overcome it, I do not see that we should not be able. Every country in Europe, with the exception of Turkey and Russia, has had to go through this experience, and has done it without much friction. We have all their experience to go upon. With respect to meters, I would say that, at the commencement, we might have a transformation table, giving the number of cubic feet, marking the cubic metre, until we should gradually have the meters replaced.

I think you put the necessity of foreign trade as the most prominent argument for a change. Why should the people whose business is all at home (for instance, gas companies) be obliged to change their language for the convenience of foreign firms with whom they have nothing to do?—For the sake of simplicity of work. There would be some difficulty in the transformation at first, but the simplification of work would be immense.

Going back to the gas-works, how would the introduction of the metric system simplify the business of the gas companies?—It would simplify their calculations.

In what way?—Take a cubic foot and divide it into cubic inches, and see what a difficulty it is.

But gas companies do not talk of cubic inches?—The question of bookkeeping would be very much simplified if you have metric weights and measures.

I do not see what difference it makes to the gas consumer if his bill is sent in in cubic metres instead of cubic feet?—I was not referring to the consumer. I was speaking of the gas company. I understood your question applied to the gas company.

In their dealings with the consumer?—I think for the gas company it would be a considerable improvement; and inasmuch as many of the gas companies now are also chemical manufacturers, and the chemical units are very much worked upon the metric system, there would be another very great simplification for them there.

Is there a single kilogramme weight or a single metre measure inside any gas-works in this country?—They use them in their chemical works.

In the laboratory?—In the laboratory, where the calculations are made—the testings. For instance, in our own gas-works, we have a large laboratory, where we test all the coals that come in, to see what their product is. Then we test all the bye-products. All these things have to be done metrically.

You select very small samples, and you analyze them, and you use the metric tables in the analysis. But I am speaking of the trade outside the laboratory, the manufacture of sulphate of ammonia in gas-works, for instance; where does the metric system come in there?—The metric system will come in there the same as it does in any other trade. We have to sell our things by the hundredweight and ton; and if we sell them by the 1000 kilos and 100 kilos, we shall have the same simplification as in other trades.

We now have the 1 lb. weight as the foundation of our weights, and the old English yard is the foundation of all our measures. What simplification can you get by substituting a weight which is two and one-tenth times the weight of a pound weight?—The simplification we shall get is in the decimal division instead of the Imperial division which we now have.

Do you mean that 16 oz. is an inconvenient division of a pound?—Certainly.

After a few questions on other matters, Mr. Stevenson asked: Are you not aware that, in actual measures, the inch is divided into 100ths and 1000ths. I read a specification last night of pipes for a water company, where the thickness of the metal was given in three places of decimals of an inch, according to the diameter of the pipe?—Witness replied: That is an attempt to get away from our present system. If you take our tables, you do not find that the inches are given in decimals at all; and what you say is an attempt to get away from a bad system. It is at attempt to solve the very thing that we are inquiring about now.

METROPOLIS WATER SUPPLY.

The Quality of the Water in July.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the month of July, show that the average daily supply amounted to 232,572,139 gallons, as compared with 216,653,007 gallons in the corresponding month of 1894. The number of services being 818,023, the rate was 284 gallons to each service. Of the entire bulk of water sent out, 124,727,621 gallons were drawn from the Thames, and 107,844,518 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·6; New River and East London (deep well), 1·1; Tottenham, 1·2; Colne Valley, 1·4; East London (river supply), 1·6; Southwark, 1·8; Chelsea, West Middlesex and Lambeth, 1·9; and Grand Junction, 2. The unfiltered river waters contained the following proportions: Thames at Hampton, 4; New River Cut, 2·1; and the Lea at Angel Road, 3·2. The Thames at Hampton was, on July 1, turbid and pale yellow in colour. It was of excellent chemical and good bacterial quality. As delivered by the five Companies drawing from this river, it was in every case efficiently filtered, and of excellent chemical and (with one exception) bacterial quality for dietetic purposes. The bacterial improvement effected by the various Companies is expressed by the following percentage numbers: Chelsea, 93·94; West Middlesex, 97·88; Southwark (No. 4 well), 99·7; Grand Junction, (general filter well at Hampton) 76·37, (general filter well at Kew Bridge and south filter well) 96·67; and Lambeth, 97·88. The New River Cut, before entering the subsidence and storage reservoirs, was, on July 3, turbid and very pale yellow in colour. It was of excellent chemical and good bacterial quality. By passing through the storage reservoirs, it was greatly improved bacterially; and, after efficient filtration, was of excellent chemical and bacterial quality for dietetic purposes. Bacterially it was improved before delivery to the extent represented by the following percentage numbers: General filter well and No. 1 filter well, 99·35; No. 7 filter well, 95·16. The water taken from the Lea by the East London Company at Angel Road on July 3 was turbid and pale yellow in colour. It was of excellent chemical but inferior bacterial quality, and did not exhibit

much improvement bacterially after storage for fifteen days. After efficient filtration, it was of excellent chemical and bacterial quality for dietetic purposes; the total bacterial improvement being represented by the following percentage numbers: No. 1 Essex well and No. 11 filter bed, 99·24; No. 2 Essex well, 99·43; and No. 12 filter bed, 99·62. The deep-well waters of the Kent, Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were of excellent quality for dietetic purposes; and the Colne Valley Company's water, being softened before delivery, was thus rendered suitable for washing. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, and East London (deep-well) waters were clear and colourless; the New River and East London (river supply), clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river waters before and after storage, the Thames water after preliminary filtration used by the Grand Junction Company, and the supplies of the various Companies collected on the 1st, 3rd, and 4th of July, yielded the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw and Stored River Waters.		
Thames at Hampton, July 1	1320	18·7
Thames at Hampton, after storage for 14·7 days (Chelsea Company), July 1	300	19·4
West Middlesex Company's water (supplying filters Nos. 1–5), July 2	880	18·7
Grand Junction Company's water arriving at Kew from Hampton, July 2	140	19·5
Grand Junction Company's Water passing on to No. 3 filter at Kew Bridge, July 2	340	19·8
New River Cut before passing reservoirs, July 3	1240	16·7
New River Cut after passing reservoirs, but before filtration, July 3	460	17·1
Lea at Angel Road, July 3	2100	17·4
Lea at Angel Road, after storage for 15 days (East London Company), July 3	1720	17·9
Filtered River Water as Supplied.		
Thames—		
Chelsea Company's general well, July 1	80	19·4
West Middlesex Company's general well, July 2	28	19·2
Southwark Company's No. 4 well, July 1	4	18·9
Grand Junction Company's general filter well at Hampton, July 1	312	19·3
Grand Junction Company's general filter well at Kew Bridge, July 2	44	19·5
Grand Junction Company's south filter well at Kew Bridge, July 2	44	19·7
Lambeth Company's general well, July 1	28	19·3
Lea—		
New River Company's general filter well, July 3	8	16·9
New River Company's No. 1 filter well, July 3	8	16·9
New River Company's No. 7 filter well, July 3	60	18·9
East London Company's No. 1 Essex well, July 3	16	17·7
East London Company's No. 2 Essex well, July 3	12	16·3
East London Company's No. 11 bed, July 3	16	17·7
East London Company's No. 12 bed, July 3	8	18·3
Deep Wells—		
Kent Company's new well at Deptford, July 4	44	11·3
East London at Lea Bridge, July 3	4	11·3

In their report to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water supplied to London during July, as ascertained by tests of samples taken daily on behalf of the Water Companies, Messrs. Crookes and Dewar say: Of the 189 samples examined, one was recorded as "slightly turbid," and one as "clear, but dull." The remainder were clear, bright, and well filtered. July was the wettest month since November last, when an excess of 2·49 inches of rain fell in the Thames Valley. The actual amount of rain during the month just passed was 3·41 inches; and as the mean of 25 years is 2·58 inches, there has fallen an excess of 0·83 inch. With the exception of a heavy storm on the 1st, the first half of July was dry; after the 1st, scarcely any rain fell till the 18th—the greater part falling between the 18th and 25th. The high level of purity of the Thames-derived waters, to which we drew attention in the report for June, was sustained in July, notwithstanding the fact that turbidity and peaty colouring matters are always washed from the land into a river by heavy rain following a drought. A comparison of the chemical composition of the waters in July and in June shows that the constituents are almost identical in quantity. We have continued to examine the samples drawn from the clear-water wells of the Water Companies at their works, and from the unfiltered river water. The unfiltered Thames water contained an average of 3425, and the filtered water at the works contained 30 microbes per cubic centimetre.

Reductions in Price.—The Ashford Gas Company have reduced the price of gas 1d. per 1000 cubic feet; the Tottenham and Edmonton Gas Company will make a similar concession to the consumers at Michaelmas; and the Faversham and Kidsgrove Gas Companies have decided to bring their prices down 3d. The Directors of the Salisbury Gas Company have taken off 1d. per 1000 cubic feet to private consumers as from the 1st ult.; making the price 3s. 3d. The price of gas at Hanley has been reduced by the British Gaslight Company from 2s. 6d. to 2s. 3d. per 1000 cubic feet. A reduction from 2s. 9d. to 2s. 6d. was effected a year ago, with the result that the consumption increased in twelve months by 17½ million feet—mainly owing to the rapid extension in the use of gas as fuel. At Hull, the same Company have announced a reduction of 2d. per 1000 feet as from the 1st ult.; making the price 1s. 10d.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

The Chief Engineer's Report on Available Sources of Water Supply.

(*Continued from p. 407.*)

II.—*General Description of Sources of Supply.*

The sources of supply to which I propose to direct attention are situated at altitudes above 600 feet, extending to 2800 feet, above the sea-level at the head waters of the Rivers Usk, Wye, and Towy, in the counties of Cardigan, Brecon, Radnor, and Montgomery. The areas from which the water would be derived are composed of the impermeable beds of the primary rocks of the old red sandstone and Silurian systems, which are noted for the purity of the water which flows from their slopes.

Owing to the general altitude of these districts, on the steep slopes of the surrounding hills, arable cultivation is almost impossible; the lower portions being chiefly composed of mountain pastures running up into bare unculturable wastes, with but a sparse population in any part. On these high lands, situated as they are near the western seaboard, the rainfall, as compared with that of the Thames Valley (27 inches), is very heavy—varying from 45 up to 75 inches or more per annum. Consequently, from a total area of 312,400 acres, or 488 square miles, 415 million gallons a day can be obtained, after making full allowance for dry years and evaporation, and due compensation in water to the streams and rivers from which the supply is derived, compared with 300 million gallons a day without compensation from the 3542 square miles in the Thames Valley above Molesey.

The altitude and contour of the valleys also is such as to permit of the water being stored in economical reservoirs, and flowing by gravitation into service reservoirs situated at an altitude of about 300 feet above the sea in the neighbourhood of London; so that pumping at the source or for the general supply of the Metropolis is unnecessary.

The scheme of works which I propose to lay before you may, for the purposes of description, be divided into five main sources—

(1) The valley of the Usk.
(2) The Yrfon, a tributary of the River Wye, combined with the upper sources of the River Towy.
(3) The Edw, another tributary of the Wye.
(4) The River Ithon, which ultimately flows into the Wye.
(5) The upper portions of the Wye itself.

III.—*Description of the Proposed Sources of Supply, with the Necessary Reservoirs, &c.*

(1) *Usk.*—The River Usk, which falls into the Bristol Channel at Newport, takes its rise among the Brecon Beacons and the hills called Mynydd Epynt, which lie to the north-westwards and south-west of the town of Brecon, above which town the main river has a general easterly and westerly direction. The geological character of the district is almost entirely composed of beds of the old red sandstone formation.

Briefly speaking, the supply will be derived mainly from the upper part of the Usk Valley by conduits which will skirt the hills at an altitude above the 600 feet contour line, so as to leave the lower and more cultivated and populous portions of the valley entirely untouched. The water from these upland drainage areas, 136,000 acres in extent, including the district of the Black Mountains which lie eastwards of the town of Brecon, would be led by conduits into a large reservoir, which would be formed most economically on the site of an existing shallow lake called Llangorse. The top water-level of the present lake, after being raised 93 feet, would be 595 feet above the sea; and its area would be 2800 acres—being 5 miles in length, and more than 1¼ miles broad at its widest part. Its contents would be about 38,000 million gallons; and the dam to retain this enormous quantity of water would be only 130 feet in height as an extreme, and of comparatively short length. For economy of construction, no reservoir with which I am acquainted excels this.

The only source of contamination which has been noticed by the Chemist in his report is occasioned by the small village and farmhouses on the banks of the existing lake, which would be submerged were the proposed reservoir constructed, and so remove the only possible source of pollution in the district. For it must be remembered that the water in the present lake is no criterion of the purity of the water which will be derived from this district, as in future the water stored in the proposed reservoir will be derived from other sources, the chemical analysis of which, as instanced by that of the River Usk, given in the Chemist's report, is of exceptional purity. But even the water now stored in the existing lake compares favourably in many respects with the filtered water at present supplied to the Metropolis.

The construction of this reservoir would involve the diversion of a portion of the Mid-Wales and Brecon and Merthyr Railways near their junction at Talyllyn. This, however, is a matter which can easily be effected; and, if my remembrance of the Mid-Wales Railway is not incorrect, with some advantage to the railways themselves.

After making full deductions for dry years, evaporation and compensation, a supply of 182 million gallons a day can be obtained from this source. A portion of the compensation would be given from a reservoir to be constructed near the village of Trecastle in the upper portion of the valley; while another portion would be given out of the proposed Llangorse reservoir, the bulk of which would be discharged into the River Usk, and the remainder down a small stream which flows into the Wye. From the reservoir at Llangorse, the main aqueduct, hereafter described, would commence and carry water to London; being joined at a distance of about 7 miles from Llangorse by the tributaries which would flow in from the northwards.

I may state that in all cases, whether for compensation or supply, the reservoirs are so designed as to contain 180 days' storage—that is, they would last, when once filled, for a period of 180 days, without taking into account the natural inflow of water which undoubtedly would take place during so long a period in a climate so humid as that

which we are considering. Consequently, I am sure that ample provision has been made against fluctuating rainfall or droughts in excessively dry years.

(2) *Yrfon.*—At a short distance above the town of Builth, the Wye is joined by a large tributary named the Yrfon, which takes its rise to the westwards among the hills which form the boundary between the Wye and the Towy. Passing up the River Yrfon to about a mile above the village of Llanynis, a fine site for the storage of water is to be found; and it is at this point that the second great branch of the scheme would be located. Above this point there is an available drainage area of some 67,000 acres running up to altitudes of from 1700 to 2000 feet above the sea. The whole of this drainage area is composed of beds of the Silurian age of the Wenlock, Bala, and lower Llandovery series.

At the place indicated above Llanynis, a dam across the river, about 166 feet in extreme height, would form a lake 2850 acres in area, the top water of which would be 606 feet above the sea-level, and would contain 31,000 million gallons. This lake would form, with the island which it would contain, a most picturesque object in the landscape; it having a serpentine course of over six miles in length, with three branches to the northwards from ¾ mile to 1½ miles in length. In this case also, a diversion of the Central Wales Railway would be required, which, from the sections of that line I have examined, can be easily carried out, with almost as much advantage to the line itself as in the case of the Mid-Wales Railway at the Llangorse reservoir above referred to.

In addition to the natural drainage area of the Yrfon above spoken of, the drainage from 19,800 acres of the Upper Towy can be poured into the above reservoir by diverting the flow of the River Towy through a tunnel about 4¼ miles in length. This district of the Upper Towy is remarkably barren and uncultivated, running up to altitudes of from 1700 to 1800 feet; the geographical structure of the district being composed entirely of the rocks of the lower Llandovery series.

From these two areas on the Towy and the Yrfon, by the large reservoir before described, a supply of 135 million gallons a day is available for London, after making liberal allowances for dry years, compensation to the River Yrfon, and the proper proportion of evaporation. The compensation to the River Towy would be afforded by the construction of a reservoir on one of its tributaries a little below Capel Ystradffin, from which the compensation water would be passed down the main stream—the compensation to the Yrfon being given from the Yrfon reservoir itself.

(3) *Edw.*—A little below Builth, the Wye is joined on its eastern bank by a tributary stream called the Edw. Upon this stream there is an available drainage area of 17,000 acres, situated above an admirable site for a reservoir of 570 acres in extent, the top water of which would be 700 feet above sea-level. The drainage area is composed of rocks of the upper and lower Silurian series, with certain interpolated volcanic beds, and will give a supply, after dry years, evaporation, and compensation have been allowed for, of 18 million gallons a day.

(4) *Ithon.*—At a point about a mile above the village of Ystradenny upon this river, there is an available drainage area of 25,000 acres, running up to altitudes of from 1200 to 1500 feet above the sea. It is composed of upper Silurian rocks of the Wenlock series. On this river can be constructed a reservoir about 900 acres in extent, the top water of which would be 900 feet above the sea-level. This again would form a picturesque object, as it would consist of two main branches—one 4 and the other 2¼ miles in length. From this reservoir, which would contain about 9000 million gallons, a supply of 37 million gallons daily could be obtained for London.

The compensation for the water so abstracted from the Ithon would be given from a reservoir situated on its tributary stream, the Clywedog, just below Abbey-Cwmhir. To this reservoir there would be a drainage area of 9800 acres. The top water-level of the reservoir would be 800 feet above the sea, and would afford ample compensation to the stream below.

(5) *The Upper Wye.*—The fifth source of supply to which I would direct attention is that of the Upper Wye. At a point about 4 miles above the town of Rhayader, there is a remarkably good site for a reservoir with a top-water altitude of 900 feet above the sea. Draining into this is an area of about 22,000 acres, the whole of which is composed of the lower Silurian beds of the Llandovery series. It runs up to great altitudes of more than 2300 feet on the slopes of Plynlimmon. At the place indicated, a reservoir having an area of 900 acres could be constructed. Its extreme length would be 4¾ miles, with an extreme breadth of about half a mile. The dam would be about 130 feet in height; and the capacity of the reservoir, 10,500 million gallons. From this reservoir, after providing for dry years, evaporation, and compensation, a supply of about 43 million gallons a day could be obtained for London.

These five branches, into which the scheme naturally divides itself, afford an opportunity of so designing the works as to permit of their gradual construction as the necessities of the case demand; so that if, in future, a portion was at first found sufficient, it could be added to as necessity arose, by taking in any of the five sources as occasion might dictate.

To summarize, therefore, the quantities that can be obtained from these sources, we may throw them into the following table:—

	Million Gallons per Day.
(1) The Usk and Llangorse areas	182
(2) The Yrfon and Towy sources	135
(3) The Edw	18
(4) The Ithon	37
(5) The Upper Wye	43
Total	415

To give some idea of what this quantity of 415 million gallons a day represents, I append a table showing the average natural flow of the Thames at Teddington Weir, inclusive of the quantity pumped from the river and supplied to London during certain months of the years 1884–5–7, 1891–3. Taking the average flow of these five selected months at 333·6 million gallons a day in the Thames, the quantity of water obtainable in Wales as a certainty at all periods of the year may be said to exceed the dry-weather flow of the Thames by nearly 81·4 million gallons a day.

Date.	Total Monthly Quantity. Million Gallons.	Daily Average for the Month. Million Gallons.
1884—August	11,706·7	377·6
1885—August	9,547·8	307·9
1887—August	10,573·2	341·1
1891—July	10,642·9	343·3
1893—September	8,949·3	298·3

But this may be said to be merely an exceptional case of circumstances arising in individual months of particular years. We can, however, view the Thames from another standpoint. In the following table, I give the average natural flow of the Thames at Teddington Weir for five consecutive months in 1884, three months in 1885, four months in 1887, and six months in 1893. The average flow of these periods amounts, as will be seen, to 404 million gallons a day; so that we may say that the quantity of water obtainable from the five sources above enumerated exceeds the average total flow of the Thames over periods of from three to six months' duration. It is only by such comparisons as these that we are able to understand what the available yield of the Welsh district is, or the capabilities of the Thames to afford a supply to the Metropolis. It is useless to talk of the average flow of the Thames, including the winter floods, as a source of supply; for the Royal Commissioners have recently, after careful inquiry, reported that the Thames floods should not be used, on account of the contaminated nature of the drainage area from which they would flow.

Date.	Daily Average Natural Flow. Million Gallons.
1884—Five months, July to November	417
1885—Three months, July to September	393
1887—Four months, July to October	393
1893—Six months, June to November	413
Average	404

Assuming that the Thames and Lea were entirely abandoned as sources of supply for London, we should have left as available uncontaminated sources the chalk wells in the Lea Valley and those of the Kent Company. The Royal Commissioners have given it as their opinion that from the Lea Valley 40 million gallons per day can be obtained; and if pumping from the river were to be abandoned, this, in all probability, would be the case. From the chalk wells of the Kent Company, they estimate a yield of 27 million gallons a day. If we now add these 67 millions from the chalk wells to the 415 million gallons available in Wales, we obtain a total possible volume of 482 million gallons a day, which, at the rate of 35 gallons per head per day, would afford a supply to a population of nearly 13,800,000 persons, which would probably be the population of the districts now supplied by the various Water Companies in the year 1945.

Among the works above proposed, the construction of the large reservoirs suggested is the most characteristic feature. Undoubtedly two of them—that at Llangorse and that on the River Yrfon—would be the largest ever constructed in this country. The height of the dams, excepting in the case of the Yrfon reservoir, which is 166 feet, is in no way remarkable, as I have myself constructed an earthen reservoir embankment 125 feet in height; but in all probability, in all the cases mentioned, masonry dams will be found most suitable to the circumstances of the case.

Although the Yrfon dam would be 166 feet in height, and the highest in this country, such a dam is perfectly feasible, as we have instances in France of dams of greater height, which have been constructed with perfect security; and one instance in this country—the Vyrnwy—of a dam of greater height than any of the others now proposed. In fact, masonry dams, properly constructed, are among the most stable and secure of engineering works.

It is somewhat difficult to form an idea of what these reservoirs would be like when brought to completion. I have therefore added below a short table giving the altitudes and areas of some of the best-known lakes in this country. It will consequently be seen that the Llangorse reservoir, 2800 acres in area, would be somewhat larger than the Ullswater lake in Cumberland; and its top water-level would exceed that of Ullswater by 115 feet. In the case of the reservoir on the Yrfon, 2850 acres in area, it would exceed Ullswater by 550 acres, and falls short of Loch Katrine—the source of supply for Glasgow—by about 150 acres, and Windermere by 450 acres. The altitude of its water surface, however, would be 126 feet above that of Ullswater, and 246 feet above that of Loch Katrine. It will have been noticed that all the reservoirs for the supply of London are situated at greater altitudes than the lakes, with the exception of Haweswater, in the table below. This, I need not point out, is of paramount importance to the scheme in question, for it enables the Metropolis to be supplied by gravitation without the aid of pumps.

Lakes.

	Top Water-Level.	Area in Acres.
Bala	530	1000
Windermere	137	3300
Thirlmere	533	875
Ullswater	480	2300
Derwentwater	238	—
Haweswater	694	683
Loch Katrine	360	3000

Artificial Reservoirs.

	Top Water-Level.	Area in Acres.	Capacity, Million Gallons.
Vyrnwy reservoir	825	1180	13,000
Thirlmere, as raised	584	793	8,130

(*To be continued.*)

The Gravesend Town Council and the Water-Works.—The Gravesend Town Council have instructed their Clerk to prepare a report with a view to an application being made to Parliament for power to construct water-works and supply water, or, alternatively, to purchase the undertaking of the Gravesend Water Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Perth Gas Commissioners are into the thick of the question of the removal of the Corporation Gas-Works from the present site in the centre of the city to one upon which there will be room for the extensions which, according to all appearances, it will soon be necessary to make upon the manufacturing plant. They met on Monday night to discuss, not the question of removal—for all, except perhaps one member of the Commission, are agreed upon the necessity for removal—but the question of whether the proposed new site, known as the Sand Island, is suitable. I have not had the opportunity of visiting the site; but from what I learn, it does not conform to its name, in respect that it is not an island. It is only a stretch of sandy ground on the banks of the River Tay; and, unless in times of flood, it is not surrounded by water. It is situated at the lower end of the city, in one of the upper navigable reaches of the Tay, which gives it the great advantage of water communication with the rest of the world. It is also near the railway, from which a siding could easily be obtained, which is also in its favour. It possesses the further advantage that it is near to the last large gasholder which the Commissioners erected, and which could be superintended from the works without extra cost. Its low-lying situation also makes it suitable for the erection of gas-works; and the promoters of it find a further reason for adopting it in that, being within the city bounds, it would retain for burgh purposes the whole of the assessments which would be leviable upon the works. These are all reasons of great importance in the selection of a site for a gas-works; and others were mentioned in the discussion. It would appear as if the site had been selected by the Commissioners, or some of them, and that then Mr. Whimster, the Engineer and Manager to the Commission, was asked to report upon it. This he did, giving his estimate of the cost; and he was then asked to report again. His second report was also favourable; but the Commissioners resolved to have an independent opinion on the subject, and called in Mr. W. Foulis, the Engineer and Manager to the Glasgow Corporation Gas Department. Mr. Foulis, in his report, a summary of which I gave a fortnight ago, while not stating disapproval of the scheme, was careful to point out the extra cost which would be involved in it, by reason of the fact that the foundations for the buildings would require to be made to a depth of 15 feet from the surface of the ground. Even with this, however, he seemed to think that the scheme was feasible; and he did not discourage the Commissioners from adopting it.

In the discussion on Monday night, Mr. Wright, the Convener of the Works Committee of the Gas Commission, urged the adoption of the scheme, on the grounds that the site was already the property of the town; that another site which had been mentioned, on Lower Friarton Farm, being two miles away, would interfere with the sale of coke in the town—the loss to the Commission in that matter alone being, according to his estimate, about £100 a year; and that to place the gas-works outside the burgh would mean an annual loss to the rates of nearly £400, which, capitalized at thirty years, meant a loss to the citizens of about £12,000. Replying to anticipated objections, he said one of these was that the works might get flooded; but that £1000 had been allowed for foundations, "and all that was necessary, in so far as the gas-works were concerned, was retort-benches." It having been pointed out that the ash-pans would be some 3 or 4 feet below flood-level, Mr. Whimster explained that he proposed to put the whole of the retort-benches into a concrete basin, the bottom of which would be about 8 feet below the present level, which would prevent the water getting in. The purifiers would be in an iron chest, about 5 feet deep. A member said that that, again, would be 2 feet below the flood-level, and that he knew the force of the current would send water into them. The objection was then raised that the works might be cut off from communication with the town in times of flood, unless they were prepared to raise the level of the shore all the way down to them.

Motions were made that a report be obtained as to the suitability of the Friarton Farm site, and that a Special Committee be appointed to confer with the Prison Commissioners with regard to their objection to the planting of gas-works in the vicinity of the prison. There seemed to be a general desire for delay in coming to a decision in the matter; and it was ultimately agreed to ask Mr. Whimster to report on the comparative cost of the two schemes of the Sand Island and Friarton Farm. I should think this was the most sensible resolution to come to. The Sand Island may be a most excellent site in many ways; but it seems to me to be a risky one. It would be most undesirable to have the gas-works planted where they would be liable to be surrounded by raging floods. Running water is a most erratic element; and it is not beyond the bounds of possibility that, unless most costly works were undertaken to raise the level of the shore "right down," as a Commissioner expressed it, the river might cut a new channel between the works and the mainland, and sweep away the supply-pipes. The works must be made safe, whatever the cost; and it will not do to push forward a scheme which has elements of risk in it, without looking at other sites, and counting the cost both of certain and of probable outlays.

The Greenock Police Board, out of the good working of the past year in the Corporation gas-works, have been able to reduce the price of gas from 3s. 2½d. to 3s. per 1000 cubic feet.

The accounts of the Aberdeen Corporation Gas Department for the past year have not been published yet; but it is announced that it is expected that the Gas Committee will be able to reduce the price of gas from 3s. 5d. to 3s. 3d. per 1000 cubic feet. Last year a reduction of 3d. per 1000 cubic feet was made, which makes 5d. in two years. Mr. Alex. Smith the Engineer and Manager, with his right hand, is thus able to beat his left hand in the form of the Electric Lighting Department, which is also under his charge. The Corporation have just completed the laying of a long stretch of new mains to the west end of the city, which should assist greatly in the distribution.

The Forfar Gas Corporation have this week reduced the price of gas to 3s. 9d. per 1000 cubic feet, which is 6d. less than at this time last year. The reduction is due to the new plant which the Manager (Mr. Forbes Waddell) has introduced. The accounts for the past year, which I have already given, were approved, after some criticism by one of the members of the Corporation, which was not of any value. Notice has been given of a motion that a photometer be provided at the gas-works, which should be of great assistance to Mr. Waddell in keeping up the illuminating power of the gas he sends out.

A new smoke-consuming apparatus, which has been patented by Mr. W. M'Glashan, consulting engineer and surveyor, of Leith, was tested at the Royal Infirmary, Edinburgh, on Wednesday, and gave satisfactory results. In Mr. M'Glashan's process, crude oil is used as the means of increasing the flame of the waste gases, by which the smoke is consumed before it enters the chimney. The oil supply is arranged to work automatically.

An aged man, who has been in charge of the small gas-works at Macduff for many years, is now obliged to retire on account of advancing infirmity. This is always more or less of a melancholy incident in the life of a man; but in this instance, the Company have the additional element to disturb their minds that, along with the wearing out of their Manager, they have learned that their works are quite done. Mr. Smith, of Aberdeen, has been called in to report upon their condition, and what will be necessary to make them fit to meet the demands upon them.

One of those unpleasantnesses which often arise between local gas companies and municipalities, regarding the supply of gas for public lamps, has just been amicably settled at Turriff. I understand that a former Secretary and Manager to the Gas Company was in the habit, although a number of the lamps were under meter, of disregarding the readings of the meters—being satisfied that there was an amount of waste, on account of defective fittings, boys turning on unmetered lamps during the day, and the like, to justify him doing so; and that when this fact was discovered, after the present Secretary came into office, the Police Commissioners claimed a rebate on the past four years. Though the practice was undoubtedly a wrong one, the Secretary would appear to have justified it to himself on the ground that the amount received from the Commissioners was under the average which is paid by the Police Commissioners in neighbouring towns. The sum paid for gas is only about 9s. 6d. per lamp per annum; the lamps being only lighted on moonless nights. The former Secretary, therefore, seemed to have endeavoured to overcome the effect of a hard bargain. Most unqualifiedly I say it is mistaken policy on the part of a gas company to do anything, which savours of taking advantage of anyone. It is far better for a company rather to be generous to local authorities, even to the suffering of a slight loss, than to attempt anything smart, not to say questionable. There is sufficient feeling antagonistic to gas companies, particularly in small communities, without the company doing anything to create more. In this case, it must not be forgotten that it was not the Company, but their late Secretary, who did the wrong. In settling the matter, the Police Commissioners have exhibited a great degree of magnanimity. Instead of pressing their claim, they have agreed to accept, as a settlement, that they are to pay for the past two years according to the average of the test meters for the ensuing lighting season; and the number of meters is to be increased.

The Aberdeen Town Council have, as part of a scheme for the improvement of the water supply for the city, agreed to lay a concrete floor in the large reservoir at Invercannie, where the water is taken from the River Dee, at a cost of £4430. The work was very much needed, as hitherto the flooring of the reservoir has been very muddy, and leeches and other objectionable forms of a quatic life have been apt to engender in it and to get, occasionally, into the distribution pipes to the dismay of the consumers.

The Dundee Town Council have resolved to proceed with works for the filtration of the water in Monikie reservoir, before sending it into the city. The estimated cost of the works is £8000, which, it is calculated, will entail an annual charge of £450, or about ¼d. per pound on the rateable rental; but it is expected that no increase will require to be made on the rates, to provide this sum.

The Glasgow Water Commissioners recently opened the Loch Chon section of the new aqueduct from Loch Katrine to the city. At the opening ceremony, Bailie Osborne, the Convener of the Water Committee, said the new section would enable them to add 6 million gallons of water per day to the supply. Mr. J. M. Gale, the Engineer to the Commissioners, said that the section was 3¼ miles long. It had cost £95,000, or about 6 per cent. more than the parliamentary estimate of 1885; and it had occupied four years in construction. The distinguishing feature of the contract was the hardness of the rock through which the tunnels were driven, and the consequent large number of air-compressors and other appliances which the work required. Mr. George Waddell, on behalf of the Contractors, Messrs. Waddell and Sons, of Edinburgh, presented ex-Bailie Osborne with a silver key, with which he opened the gate leading to the sluices, which were then opened, allowing the water to flow from the old aqueduct alongside into the new channel. In the course of their tour, the Water Commissioners practically inspected the whole line of the new aqueduct between the reservoir at Mugdock and Loch Katrine. Its total length is about 23¾ miles. Of this, 16¾ miles are completed, 5¼ miles are under construction, and 1¼ miles (being the length of the Loch Katrine Tunnel) are not yet commenced. The new aqueduct will be 1¾ miles shorter than the old one, with which it runs nearly parallel. It is 12 feet wide and 9 feet high where it is not lined with concrete, but only 10 feet wide where it is lined. The bottom is laid with concrete throughout the whole length; and it has a fall towards Glasgow of 1 in 5500. It consists of a succession of tunnels, which, for the greater part, were driven from the two ends without shafts; the drills being worked by compressed air at a pressure of about 60 lbs. on the square inch. It will discharge 70 million gallons of water per day, which, added to the 40 million gallons per day derived from the old aqueduct, will bring up the total supply to the service reservoirs to 110 million gallons. Allowing for stoppages in the flow for examination and repairs, however, only 100 million gallons per day can be calculated upon as available for the city. The syphon pipes which cross the valleys of the Endrick and Blane consist of four lines of 48-inch cast-iron pipes, two of which are being laid at present.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 24.

Sulphate of Ammonia.—Prices during the week have been somewhat irregular. There has been some covering of "bear" sales for August delivery. This has been done principally in Scotland—resulting in an advance there of about 3s. 9d. per ton. Prices at other points have not, however, been affected; but, owing to the business referred to, the market closes with a rather steadier tone—the quotation being £9 5s. to £9 7s. 6d. per ton f.o.b. at the ports. There is more inquiry for delivery ahead; but, so far, buyers will not pay a premium acceptable to sellers.

Nitrate of Soda is quiet; and 8s. 1½d. per cwt. is now the nearest value of fine quality on spot. The forward position is unchanged.

LONDON, *Aug.* 24.

Tar Products.—The only feature of interest in this market is a better demand for naphthalene, both refined, crude, pressed, or drained salts. There appears now to be a permanent market for this very objectionable product. It is true the price offered is very low; but, seeing that the great bulk of naphthalene salts produced in the country are employed for fuel purposes, it is a relief to find there is a more useful outlet for them. Pitch is still well inquired for; and some lots have changed hands, for forward delivery, at 34s. west-coast ports, and 37s. 6d., less discount, for east-coast ports. The increased output of Scotch creosote is seriously impairing the market prospects of oils from coal tar. Trade in common tar-oils was never worse than it is at the present moment. There are several reported sales of anthracene outside the Committee, at 9½d. for "B" quality, which is ½d. to 1d. below what the Committee quote for "B" anthracene. Most of the "A" anthracene appears to be well taken up; and there is none offering. The better value of pitch is slightly firming the price of tar; but the only nominal value of tar oils (which form a very large proportion of the tar itself) unfortunately more than counterbalances the improved prices obtaining for pitch. Transactions during the week are noted as follows: Tar, 18s. to 21s. 6d. Pitch, west-coast, 34s.; east-coast, 37s. to 38s. Benzols, 90's and 50's, 11½d. for London; 11d., country. Solvent naphtha, 1s. Toluol, 1s. Crude, 30 per cent., naphtha, 4½d. Liquid creosote, 1¼d. Naphthalene salts, 24s. Cresylic acid, refined, 1s. 1½d.; brown, 10½d. Carbolic acid, 60's, 1s. 6d. Anthracene, "A," 1s.; "B," 9½d. to 10½d.

Sulphate of Ammonia is undoubtedly firmer. Buyers appear to have come to the conclusion that prices have touched bottom. Considerable business is being done, and largish contracts have been made during the week at £9 2s. 6d. to £9 6s. 3d., less 3½ per cent., all ports; while gas liquor is offered at 6s. 6d. to 7s. 6d. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—At the last meeting of the Manchester Coal Exchange, it was reported that the Salford Corporation had at length settled at any rate a portion of their gas-coal contracts. With regard to these contracts there has been a good deal of very strong criticism amongst the principal representatives of the coal trade; one or two of the largest Lancashire firms having declined to tender on the forms sent out by the Corporation, as they would not bind themselves in any way to the conditions it was sought to impose. In these cases, tenders were sent in on their own forms; and, so far as I can gather, none of them have been entertained by the Corporation. There would seem to have been a good deal of finessing with regard to prices, in connection with the tenders that were considered, which perhaps accounts for the extraordinary delay in coming to a settlement; and the figure at which, I was informed, one large quantity, amounting to 40,000 tons of Arley gas nuts, had been secured, was so low that I should not care to take the responsibility of repeating it. The settlement of the Salford Corporation contracts may be said to practically close the present gas-coal season, which all through must have been anything but a satisfactory one to colliery proprietors, who, to secure anything like quantities, have had to cut down their prices to excessively low figures. As regards the round coal trade generally, business still drags on in a very depressed fashion, with pits not working more than half time, and supplies excessive. So far as house-fire coals are concerned, there has perhaps never before been so quiet a season; and this is largely accounted for by the fact that during the coal strike gas and oil cookers and heaters were largely introduced, and have since obtained a permanent footing, with the result that to a very considerable extent the use of coal as fuel for domestic purposes has been altogether abandoned during the summer season. The economy and cleanliness of gas-fires and gas-cookers is every summer receiving still wider recognition; and there seems to be the probability that, except in the winter months, house-fire coals will gradually go more and more out of use. Prices remain without quotable change, as colliery proprietors, in anticipation that September may bring forward an increased demand for winter requirements, are holding back from pushing sales, preferring to run short time or stock. Common round coals, for iron-making, steam, and general manufacturing purposes, continue a drug; and with the usual holiday stoppages in various districts, requirements are still further interfered with. For these, prices are very irregular, owing to the competition for business; but they may be quoted at about 6s. to 6s. 6d. per ton for good steam and forge coals, and 4s. 6d. to 5s. for best engine fuel, with ordinary sorts at 3s. to 3s. 6d.

Northern Coal Trade.—The demand continues strong for best steam coals; and in some instances a higher price is obtainable. For best Northumbrian steam, 9s. 3d. per ton f.o.b. is freely paid for early delivery. There is, however, an abundant supply of second-class coals; and the price for these shows no general advance—being still 8s. to 8s. 6d. per ton. Small steam coals are plentiful also; and are quoted at 3s. to 3s. 6d. per ton. Gas coals are steady; and some local contracts in the market may test whether there is any improvement in price. Generally speaking, the quotation for best Durham gas coals varies from 6s. 3d. to 6s. 9d. per ton f.o.b. The shipments are increasing satisfactorily, as consumers wish to take advantage of the quick despatch and low freights still current. Coke retains its firmness at about 13s. 6d. per ton f.o.b. Gas coke is a little more largely produced; but the market readily takes up the limited output. Prices of gas coke are unaltered.

Scotch Coal Trade.—The improved demand for all classes of coal which set in a week or two ago still continues; but prices can scarcely be said to be altered. Small varieties are in great demand for export. The better sorts do not seem to be in so much request for foreign orders. With the shortening days, larger quantities are being required for gas-works; but these are nearly all under contract, and the market prices are not affected. The prices now quoted are: Main, 5s. 10d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s. (full); splint, 6s. 3d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 173,516 tons—an increase on the quantity in the previous week of 3936 tons, and upon the corresponding week of last year of 166,030 tons. For the year to date, the total shipments have amounted to 4,446,094 tons—an increase over the same period of last year of 704,163 tons.

Failure of the Electric Light at a Newport (Mon.) Concert-Room.—During a smoking concert at the Falcon Inn, Newport (Mon.), on Monday last week, when several hundred persons were present, and many more were expected—a large number of tickets having been sold—the electric light failed. The premises have just been rebuilt; and the concert may have been partaking somewhat of the character of an opening of the new establishment. Fortunately the landlord had some gas on at the time; but had it not been for this resource, the audience would have been obliged to leave, as the electric light remained extinguished all the evening. It is understood that the defect was in the transformer.

Artesian Well-Boring at Birmingham.—To provide for the necessary water supply at the Grand Hotel, Birmingham, Messrs. Isler and Co. have just completed an artesian well 600 feet deep—the supply of water from it being copious and of extreme purity and softness. An accident occurred to the first bore-hole started; as when it had reached a depth of about 450 feet, the diamond boring crown got fixed, through the feed-pipe which lubricates the drill bursting. It was found, on reconnecting it, that the crown had become set; and though powerful machinery was put to work to withdraw it, it was impossible to shift the crown in any way. It was then suggested that the supply should be tested, which was done; and an ample one was obtained. But unfortunately the hardness of the water prevented it being of any use for boiler purposes, &c.; and, as a soft and pure water was a desideratum, Messrs. Isler proposed starting a fresh hole, which (as stated) has now proved successful in every respect.

Harrow and Stanmore Gas Company.—The report of the Directors, to be submitted at next Monday's meeting of the shareholders, states that, in pursuance of the powers of the Harrow and Stanmore Gas Act of 1894, since the 25th of March the Harrow District Gas Company and the Great Stanmore Gas Company have become one undertaking, under the title of the Harrow and Stanmore Gas Company; and since that date a reduction in the price of gas of 3d. per 1000 cubic feet has been made throughout the Stanmore district, as intimated in the last report. The balance of the profit and loss account is £2019. The Directors recommend that a dividend be declared for the half year to June last, at the rate of 7½ per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, and of 5¾ per cent. on the additional "C" capital; and for the three months to June at the rate of 6 per cent. per annum on the guaranteed shares—all less income-tax. The dividend on the guaranteed shares for the three months ending March was paid by the Great Stanmore Company.

The Kent Water Company and their Supply during Last Winter's Frost.—The Chairman of the Kent Water Company (Mr. G. Smith), at their recent half-yearly meeting, referring to the difficulties arising out of the frost of last winter, remarked that it was unprecedented; and he cited the following extracts from the report of Mr. J. Glaisher, the veteran meteorologist, to the Registrar-General for the quarter ending in March: "The mean temperature of the month of February, at Greenwich, was 28·9°; being the coldest February back to 1771. . . . . So far as I know, such a series of 23 consecutive low night temperatures is unprecedented." He also quoted the following from Professor Symons, in the March number of the *Meteorological Magazine*: "There is no case equal to 1895 with four consecutive days on each of which the mean temperature was below 20°." He added that these were very important facts from the highest authorities, and should find acceptance with those who were naturally annoyed by the partial and temporary inconvenience they suffered from the interruption of the abundant supply to which they were accustomed. Even a municipal water authority could not foresee or control the weather; and the provincial newspapers had abundantly proved by their records that water consumers supplied by local authorities suffered in common with, and in some towns much more than, consumers in London. The Directors, on learning early in March that some of the Company's smaller mains in exposed positions had been frozen, at once gave orders that every section of the mains so obstructed should be relaid and lowered, to afford complete protection against any recurrence of the kind. In doing their best to meet these exceptional extreme difficulties, in remedying the damages to their pipes, and providing for any recurrence in the future, the Company had voluntarily and ungrudgingly spent £15,000 out of their profits, and so taken their full share of the burden of trouble and expense the disaster had brought with it to so many. No water authority, whether municipal or corporate, could possibly have done more. In conclusion, he observed that the interval since the previous meeting had been perhaps the most remarkable period in the history of the Company. Bills had been presented to Parliament to acquire the whole undertaking by compulsion; an altogether unprecedented frost had befallen both the water consumers and the Company; and a prolonged extreme drought had involved the greatest demand ever made upon their resources. These combined events had caused the past half year to be one of considerable anxiety and strain; but, having surmounted every difficulty, the Directors could congratulate the shareholders upon the position the undertaking held after so severe a test of its soundness and efficiency.

Gas Explosion at Mile End.—In the afternoon of Saturday, the 17th inst., an escape of gas, owing to the fracture of a large main, caused a fire at the Mile End Infirmary. The arrival of the Fire Brigade soon put an end to it; and, though there was a great deal of excitement, no serious personal injury was sustained.

Sales of Shares.—On Monday last week, Messrs. Killingworth and Son sold by auction at Boston 13 fully-paid £25 shares in the *Boston Water Company* for £51 12s. 6d. each; 22 original (£10) shares in the *Boston Gas Company* for £18 15s. each; and 20 new (£10) shares at £15 10s., £15 11s., and £15 12s. 6d. each.——At the Royal Hotel, West Hartlepool, last Thursday, Mr. J. Hunter sold 500 £10 shares in the *Hartlepools Gas and Water Company* at £17 10s. and £17 11s. each; a total of upwards of £8750 being realized.

The Water Supply of East London.—At a conference of representatives of the London Vestries and District Boards within the East London Water Company's district, held last Thursday night at the Hackney Town Hall, a resolution was passed requesting the London County Council, being the Metropolitan authority, to take action against the Company to compel them to carry out their obligations, and appointing a deputation to wait upon the Water Committee of the Council to-day. A deputation is also to wait upon the President of the Local Government Board.

Ottoman Gas Company, Limited.—The Directors of this Company will report to the shareholders, at their half-yearly meeting next Tuesday, that the gas-rental in the six months ending June 30 amounted to £8738, compared with £8429 in the corresponding period of 1894; and that the net profit is £3465. The sum standing at the credit of the profit and loss account is £4177, which the Directors recommend should be dealt with as follows: Addition to the reserve fund, £1000; dividend at the rate of 7 per cent. per annum on both classes of shares, £2625; and carried forward, £552.

Rejection of the Lighting and Watch Act at Norton, near Sheffield.—A well-attended meeting of the ratepayers of the parish of Norton was held last Thursday, in order that the electors might consider the desirability or otherwise of lighting, at the expense of the whole parish, portions of two main roads in the parish—Derbyshire Lane, to the extent of the Sheffield Gas Company's mains, and Chesterfield Road, from Heeley to Woodseats. After a lengthy discussion of the subject, the proposal to adopt the above-named Act was rejected by 65 votes to 31; and so the matter will have to rest for at least twelve months.

New Joint-Stock Companies.—The Self-Lighting Gas Company, Limited, has been formed with a capital of £200,000, in £10 shares, to acquire any inventions for self-lighting gas, and all or any of the patents, patent rights, &c., in connection therewith, in any part of the world; and, generally, to carry on business as manufacturers of, and dealers in, any articles under such or other patents as may from time to time be acquired by the Company. The Menzies Water-Works, Limited, with a capital of £50,000, in £1 shares, has been formed to adopt and carry into effect an agreement, made between the Gold Estates of Australia, Limited, and J. G. Broad, on behalf of the Company, and to supply the district of Menzies Find, Western Australia, or any other districts, with water, and to carry on the general business of a water company.

The Profits of the Carlisle Gas and Water Works.—The annual accounts of the gas and water undertakings of the Carlisle Corporation for the year ending June 30 have been completed and audited; but, as they have not yet been before the Committee, the publication of an official abstract has been deferred. We learn, however, from a local paper, that while the water-works have realized a gross profit of £4900, or about the same as last year, the gross profits of the gas-works for the year were £8000, or about £1000 more than in 1893-4. The two undertakings have therefore brought into the coffers of the Corporation for the year the round sum of about £13,000. The gross profits of the gas-works in 1893-4 were £7124, while in 1892-3 they were £3763. The gross profits of the water-works in the same years were £4906 and £4502 respectively. From the gross profits of £8000 of the gas-works will have to be deducted repayment of loans, interest on stock, &c., which last year amounted to about £3300; and any payment to the reserve fund which the Committee may order (last year the amount was £700). Presuming, however, that these outgoings do not exceed those of last year, there will be about £1000 more applicable to the purposes of the city fund; while the balance from the water-works available for the general district fund will be substantially the same as before, after deductions for the repayment of loans, interest, &c., have been made.

The Proposed Water Trust for West Kent.—Mr. C. E. Baker, the Parliamentary Agent to the West Kent Local Authorities, has informed the Bromley District Council that there appears to be some misunderstanding in connection with the position of the London County Council and their Transfer Bills. The Bills are only suspended, and will be taken up in February at the Committee stage, and be proceeded with as if there had been no dissolution, with this exception—that, if the Committee choose to do so, they can insist upon having the speeches and evidence repeated before them. The position is therefore very much the same as it was; and the promotion of a Bill by the Kent authorities is a tactical piece of work, for while it would seek powers for acquiring the whole of the Kent Water Company's undertaking, the main object was, of course, the acquisition of the undertakings outside the County of London. The writer pointed out that though a Bill could be modified, and proposed provisions excluded, no additions could be made in respect of which notice had not been given. Our local correspondent says: "Mr. Baker's statement that the London County Council's Bills are only suspended, appears to have put the various local bodies at sixes and sevens; for somehow it had become generally accepted that the Transfer Bills were dead, and several of the West Kent Councils have not favoured the proposal to promote a Bill for the transfer of the Kent and Lambeth undertakings to a Joint Board formed of representatives of West Kent. The Bromley Council have resolved to ask the London County Council to inform them exactly how the matter stands, so that they may know what to do.

The Proposed Purchase of Ossett Gas-Works.—At a largely-attended town's meeting held last Wednesday, a resolution was passed calling upon the Ossett Town Council, at the earliest convenient moment, to take into consideration the purchase of the Ossett Company's gas-works; and if necessary to promote a Bill in Parliament for the purpose.

Opening of New Water-Works at Lostwithiel.—Last Thursday was a memorable day in the history of the ancient and interesting little borough of Lostwithiel, from the fact that the completion of the works for furnishing an ample supply of pure water to the town was celebrated with the customary festivities. The question of the water supply of Lostwithiel has for some years troubled the municipal authorities. Like many other towns and villages in Cornwall, the community has hitherto depended solely upon the natural resources by which it has been favoured; but the inconvenience of having to fetch from a distant stream whatever water was required, and the danger of its pollution, aroused the inhabitants to the need for a more satisfactory and commodious method of supplying the town. At first the difficulties to be surmounted were great; and it was not until Lord Robartes came to the relief of the Corporation that a solution of the problem seemed practicable. His Lordship offered free access to springs which exist on his estate at Ford—a distance of about three miles from Lostwithiel; and Messrs. S. W. Jenkin and Son, of Liskeard, devised a scheme which would involve a total outlay of about £2100. This provides for the collection of the water from three springs into a reservoir, the capacity of which is 40,000 gallons. The water is conveyed by gravitation through a 4-inch main. The reservoir is 200 feet above the highest part of the town, 300 feet higher than the point at which the water enters, and 350 feet above the lowest part. The work has been carried out by Messrs. Oliver and Minnear, of St. Blazey. The main takes a lengthy course through Lord Robartes's property; but his Lordship has met the Corporation in the most liberal manner, and has granted the authorities a 99 years' lease of the springs, with the right to renew for a similar period, at the nominal rental of 10s. a year. A large proportion of the houses in Lostwithiel have already been connected with the main. The opening ceremony was performed by Lady Robartes.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 434.)

Issue.	Share	Whe ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	23–24	..	4 7 6
100,000	10	,,	7½	Do. 7 p. c.	10	15½–16½	..	4 10 11
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	..	4 12 7
200,000	5	10 May	6½	Bombay, Limited	5	7–7½	..	4 6 8
40,000	5	,,	6½	Do. New	4	5–5¼	..	4 14 7
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258*	..	4 13 0
180,000	,,	,,	9	Do. New	100	200–210*	..	4 5 8
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	227–232	..	4 14 10
888,500	Stck.	28 Feb.	5	Bristol	100	125–130	..	3 16 11
320,000	20	28 Mar.	11½	British	20	54–56	..	4 0 4
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	22–23	..	5 0 0
51,510	10	,,	8½	Do. 7 p. c.	10	17–18	..	4 14 5
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	7¼–8¼	..	4 14 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	29–31	+1	5 6 5
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	300–305	+1	4 8 6
165,000	,,	,,	10½	Do. New o.	100	225–230	..	4 11 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	265–275	..	4 14 6
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	203–208	..	4 16 2
535,000	Stck.	28 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25–26	..	4 4 7
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12½	Gaslight & Coke, A, Ordinary	100	291–296*	−1	4 6 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112*	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	280–285*	..	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135*	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197–202*	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	187–192*	..	3 12 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277–282*	..	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	163–168*	..	3 11 5
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	131–134	..	2 19 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140–145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	200–205	..	2 18 6
3,800,000	Stck.	10 May	12	Imperial Continental	100	249–254	..	4 14 5
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	5¾–6¼	..	4 16 0
560,000	100	1 Apl.	5	Met.of Melbourne, 5 p.c. Deb.	100	115–117	..	4 5 6
541,920	20	12 June	5	Monte Video, Limited	20	17½–18½	+1	5 8 1
150,000	5	24 May	8	Oriental, Limited	5	7½–7¾	..	5 3 2
60,000	5	28 Mar.	7	Ottoman, Limited	5	5–5¼	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	102–106	..	5 13 2
500,000	100	4 June	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	10–11	..	6 7 3
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	365–375	+10	4 2 8
1,350,000	,,	,,	12	Do. B do.	100	307–312	+ 2	3 16 11
308,685	,,	,,	13	Do. C do.	100	317–322	+ 2	4 0 9
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	172–176	..	2 16 10
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	290–295	..	3 7 10
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	228–233	..	3 8 7
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	117–122	+2	2 17 5
708,000	Stck.	14 Feb.	12	Kent	100	309–314	..	3 16 5
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	260–264	..	2 16 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208–213	..	3 10 5
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	145–150	..	2 13 4
500,000	100	14 Aug.	12½	New River, New Shares	100	385–395*	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	157–163	..	2 9 1
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	292–297	..	3 7 4
						*Ex div.		

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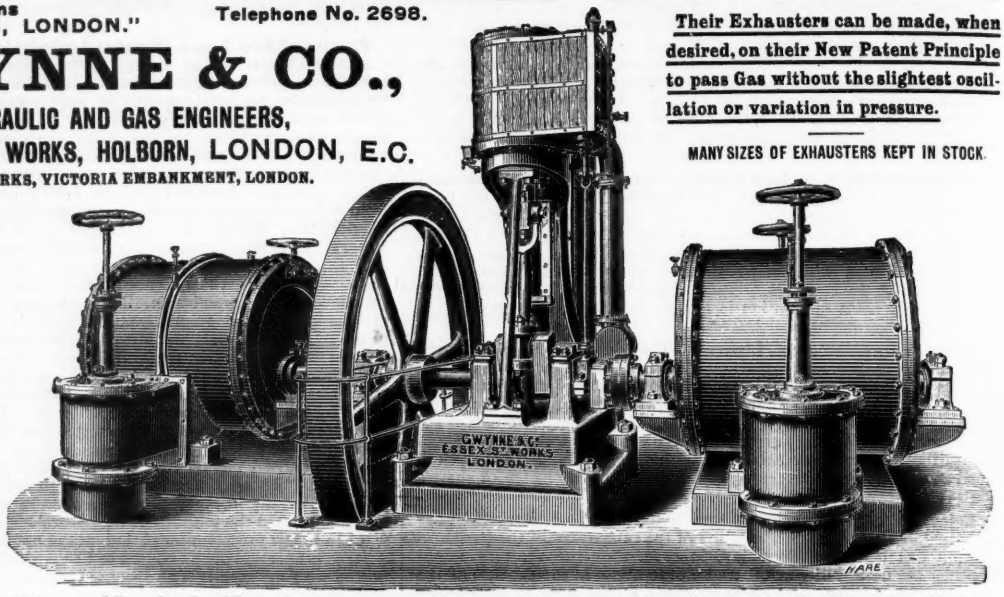

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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.

J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

TO ENGINEERS AND MANAGERS.

MR. J. L. FEATHERSTONE (late Chief Draughtsman to Humphreys and Glasgow) is prepared to supply complete WORKING DRAWINGS, SPECIFICATIONS, and QUANTITIES for WATER-GAS PLANT. Own design.

Also DRAWINGS, TRACINGS, &c., of COAL GAS PLANT; Specially prepared for work wanted in a hurry. Moderate Charges.

Temporary Offices: 27, FORE STREET, E.C.

WANTED, an Agent for the Sale of Gas- Retorts and Fire-Bricks, &c., in London and District.

Apply, by letter, with all particulars, to No. 2552, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Working MANAGER in a Small Gas-Works. Well acquainted with the Manufacture and Distribution of Gas, and competent in Main and Service Laying, Meter Repairing, Testing, Fixing, Inspecting, and the General Routine of a Gas-Works. Seventeen years' experience; total abstainer; good testimonials.

Apply to No. 2559, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

£50 REWARD.

THE above Reward will be paid by the representatives of John and George Barlow (in partnership in 1822), for information which may lead to the discovery of certain shares now outstanding, belonging to the estate. The shares are believed to be either in a Gas l ght or a Gas Appliance Company.
Address, G. C., 98, Cheriton Road, FOLKESTONE.

WANTED, a Situation as an Improver in GAS-FITTING, STOVE-FIXING, and REPAIRING, METER-FIXING, &c.
Address No. 2558, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer wanted, for a Works near Manchester, producing about 200 Million Cubic Feet per Annum.
Applicant must be thoroughly qualified; have had experience in Management of Works with Regenerative Retorts; and understand the Chemistry and Testing of Gas. He must state previous Situations, Age, and Salary expected.
Address No. 2555, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A set of Four Six-Feet PURIFIERS, in good condition.
For Price and Particulars, apply to T. G. BROWNING, Manager, Gas-Works, WHITSTABLE.

FOR SALE—The following Second-Hand GAS PLANT:—
TELESCOPIC GASHOLDER, 45 ft. by 18 ft.
Two TELESCOPIC GASHOLDERS, 60 ft. by 18 ft.
STATION METER, to pass 15,000 Cub. Ft. per hour, Rectangular Cast-Iron Case, by J. & J. Braddock.
WASHER-SCRUBBER, to pass 250,000 Cubic Feet per day, by Kirkham, Hulett, and Chandler, Ltd.
CONDENSERS, Annular, to pass 250,000 Cubic Feet per day, by C. & W. Walker.
STATION GOVERNOR, 12-in., by J. & J. Braddock.
ENGINE, 4-Horse Power, Steam.
74 MOUTHPIECES, 15 inch and 16 inch Round, ASCENSION-PIPES, BRIDGE-PIPES, and HYDRAULIC MAINS, &c., &c.
Most of the Plant is equal to new.
For further Particulars, apply to J. C. Belton, Manager.
By order,
A. MARSTON, Secretary.
Gas Offices, Willenhall.

BOROUGH OF WIDNES.

THE Corporation invite Tenders for the Purchase of from 600 to 700 Tons of GAS TAR from their Gas-Works, for the Twelve Months ending Sept. 30, 1896.
Forms of Tender and Conditions of Contract may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Tar," to be delivered to the undersigned, not later than the 2nd prox.
The highest or any tender not necessarily accepted.
H. S. OPPENHEIM,
Town Clerk.
Town Hall, Widnes,
Aug. 20, 1895.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of this Company invite TENDERS for the purchase of 700 Tons of the surplus TAR, to be produced at their Works in Radcliffe, during the Twelve Months commencing the 1st day of October next.
Particulars may be obtained from the undersigned, to whom endorsed Tenders must be delivered, not later than Tuesday, the 3rd of September next.
JAS. BRADDOCK,
Manager and Secretary.
Gas-Works, Radcliffe,
Aug. 24, 1895.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply, in whole or in part, of 32,000 Tons of GAS COAL for the Year ending Sept. 30, 1896.
Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.
Tenders, sealed and endorsed "Tender for Gas Coal," to be sent in not later than Noon of the 28th day of August, 1895, addressed to M. B. Dodds, Esq., J.P., Town Clerk, Stockton-on-Tees.
The Gas Committee do not bind themselves to accept the lowest or any tender.
WM. FORD,
Engineer and Manager.
Stockton-on-Tees,
Aug. 7, 1895.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made either from Native Sicilian Brimstone, or recovered Sulphur or Pyrites.
Specific gravity in each case to be stated. The price to include free delivery by Rail into elevated tanks 27 feet high, at the Chemical Works, Aylestone Road. Probable quantity about 1200 Tons, to be delivered as required during the ensuing Twelve Months.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than 11 o'clock a.m., on Saturday, Sept. 7.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Gas and Electric Lighting Offices,
Millstone Lane, Leicester, Aug. 21, 1895.

ALDERSHOT GAS AND WATER COMPANY.

TANK.

TENDERS are requested for the Ex- cavation and Building of a GASHOLDER TANK, at the Gas-Works, Ash Road, 8 ft. 3 in. diameter, by 25 ft. deep.
Specifications and Plans may be seen by applying to the Superintendent, Mr. Meiklejohn, on the Works, or Copies will be supplied to a limited number of firms, at a charge of 21s. (which will be returned on receipt of a *bonâ-fide* tender), upon application to the Chairman and Engineer, Mr. A. F. Wilson.
Tenders, endorsed "Tank," to be deposited on or before the 17th day of September, or addressed to the SECRETARY, at the Office, Victoria Road, ALDERSHOT.

GRAVESEND & MILTON GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of good GAS COALS required by them during a period of One or Three Years, to be delivered either free alongside their Wharf South Side of Canal Basin, Gravesend, or f.o.b. Vessels in accordance with their Specifications.
The Quantity required will be about 12,000 Tons per year.
Copies of the Specification and Form of Tender may be obtained of Mr. Joseph Davis, the Company's Engineer, Gas-Works, Gravesend.
Tenders to be sent in on or before Monday, Sept. 30, 1895, addressed to the Chairman, Gravesend and Milton Gaslight Company, 27, King Street, Gravesend.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
CHAS. R. GRAMSHAW, Secretary.
27, King Street, Gravesend.

COUNTY BOROUGH OF BRADFORD.

CORPORATION WATER-WORKS.
TO CONTRACTORS.
CONTRACT NO. 5.—NIDD VALLEY WORKS.

THE Corporation of Bradford invite TENDERS for the Construction, and Maintenance for Twelve Months after completion, of a SERVICE RESERVOIR, FILTER-BEDS, and other Works, at Chellow Heights, in the township of Heaton, in the parish of Bradford.
The Works will comprise:—
1. Masonry and Concrete Reservoir, Excavation, Earth Embankments, Clay Puddle, Upstand, Valve Chambers, &c.
2. Five Filter-Beds, having a total filtering area of 12,500 square yards.
3. Canal of Masonry and Concrete.
4. Cutting Trenches for, and Carting, Laying, and Jointing about 1700 tons of Cast-Iron Pipes, 8 inches to 36 inches diameter.
5. Formation and Construction of Sand Trap, and Screens connected therewith.
6. Forming Roads, Boundary Walls, Gateways, and Gates, &c.
7. Fitting and Fixing Valves, Gears, Sand Washers, Weirs, Appliances, and Apparatus incident to the Works.
The Drawings and Specification of Works may be seen, and copy of the Specification, with Conditions, Bill of Quantities, and Form of Tender, with reduced Drawings attached, may be obtained, at the Office of Mr. James Watson, M.Inst.C.E., the Corporation Water-Works Engineer, Town Hall, Bradford, on and after Thursday, the 22nd inst., on payment of Five Guineas, which sum will be returned in full as soon as practicable after the receipt of a *bonâ-fide* tender, with the Bill of Quantities and Schedule fully priced out.
An Assistant Engineer will meet intending Contractors at Chellow Heights Farm, on Tuesday, the 27th inst., Friday, the 30th inst., and Tuesday, the 3rd of September next, each day at One o'clock p.m., to show them over the site of the Works.
Sealed tenders, endorsed "Tender for Service Reservoir and Filter-Beds, &c.," to be sent to me, at the undernamed Office, not later than Friday, the 6th of September next.
An assurance must be given by each Contractor that he pays to the workmen employed by him not less than the minimum standard rate of wages.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
W. T. M'GOWEN,
Town Clerk.
Town Clerk's Office, Town Hall,
Bradford, Aug. 17, 1895.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 3, at One o'clock, for the purpose of receiving a Report and Statement of Accounts from the Directors for the Half Year ended June 30, 1895.
The TRANSFER BOOKS WILL BE CLOSED from Aug. 27 to Sept. 3, both days inclusive.
By order,
THOMAS GUYATT, Secretary.
9, Queen Street Place,
Cannon Street, London, E.C., Aug. 6, 1895.

BRIGHTON & HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 13th of September, 1895, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1895; to declare Dividends; to elect Auditors; and for other purposes.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 31st of August to the 13th of September, both days inclusive.
By order,
ERNEST L. BURTON, Secretary.
5, Great Winchester Street,
London, E.C., Aug. 19, 1895.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 31st day of August inst., at half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare Dividend, for the Election of Two Directors and an Auditor for the ensuing Year, and for transacting General Business.
The TRANSFER BOOKS for CONSOLIDATED STOCKS WILL BE CLOSED from the 17th inst. to the 2nd of September next, both days inclusive.
By order of the Board,
JAMES RANDALL,
Secretary.
Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 9, 1895.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.
The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.
These Appliances can now be obtained solely of the undersigned.
Winchester House, London, E.C. J. A. KELMAN.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY,
LIMITED,
GUARANTEES FIDELITY.
Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.
HEAD OFFICE:
49, CHANCERY LANE, LONDON, W.C.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

> The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) **FAITHFULL & OWEN,**
Solicitors for the Incandescent Gas-Light Company, Limited.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,

PARK STREET, SOUTHWARK, E.C.,

And at STROUD, GLOUCESTERSHIRE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

INCANDESCENT MATERIALS

OF THE VERY BEST QUALITY FOR

Lighting Power and Burning Permanence.

Recommended to Wholesale Buyers.

IN ANY QUANTITY.

Supplied by the

INTERNATIONALE

GLÜHKÖRPER COMPAGNIE,

ARNHEIM, HOLLAND.

WRITE FOR SAMPLES.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

"BEAR CREEK" CANNEL.

LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,

PINEVILLE, KENTUCKY, U.S.A.

Cable Address: "Hull, Pineville."

LONDON AGENTS:

W. J. WILSON & Co., Suffolk House, Cannon St., E.C.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE

90, CANNON STREET, E.C.

AUTOMATIC

COAL and COKE HANDLING.

We have erected, and are erecting, a number of the most complete

AUTOMATIC COAL AND COKE HANDLING PLANTS

In the World.

☛ We are now engaged erecting a plant to distribute the Coal into 375 Coke-Ovens, each 30 feet long, and convey the HOT Coke on an improved Conveyor to the Blast-Furnaces. We have also on order six Plants to elevate and convey from 200 to 2000 Tons of Coal per day. For the latter, we are supplying three Conveyors, each 72 inches wide, with Cast Steel Chain Elevators and Accessories to suit.

Address:—

NEW CONVEYOR COMPANY, LD.,

3 & 4, Lime Street Square, London, E.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON . 10,375 CUBIC FEET.
ILLUMINATING POWER . 17·50 SPERM CANDLES.
COKE . . . . . 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

AUSTRALIAN BOGHEAD.

Practical Results in Ordinary Working:—
Gas per Ton . . . 15,100 Cub. Ft.
Illuminating Power . 45·6 Candles.
For Samples and Prices, f.o.b. London or c.i.f. to Continental Ports, apply to
THOMAS RAISON & Co.,
117, LEADENHALL STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON & COAL Co. Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
Ash . . . . . 2·73 „

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.

IRONFOUNDERS,
MIDDLESBROUGH.

KENT'S THICK GAS COAL

RAISED AT
The Wharncliffe Woodmoor Colliery,
BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1). . 1·276
Weight of One Cubic Foot. . 79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal . . . . . 2·68 per cent.
Volatile Matter. . . . . 35·60 „
Fixed Carbon . . . . . 58·80 „
Sulphur . . . . . 0·96 „
Ash. . . . . 1·96 „

COMMERCIAL ANALYSIS.

Gas per Ton of Coal . . . . 11,760 cub. feet.
Gas per Cubic Foot of Coal . 418 „
Illuminating Power . . . . 17·44 candles.
Value of One Cubic Foot in Sperm . . . . . 418 grains.
Value per Ton of Coal in Sperm . . . . . 703 lbs.
Coke per Ton of Coal . . . 1367 „
Coke . . . . . 61·05 per cent.
Ash in Coke . . . . . 3·21 „
Sulphur Eliminated with Volatile Products per Ton of Coal 9·4 lbs.
Sulphur in Coke per Ton of Coal . . . . . 12 „
Ammoniacal Liquor per Ton of Coal . . . . . 19·7 galls.
Tar per Ton of Coal . . . . 12·2 „

R. O. PATERSON, C.E.
Gas-Works, Cheltenham, 8th August, 1894.

For Price, &c., apply to the
Wharncliffe Woodmoor Colliery Co LIMITED,
BARNSLEY;
Or to Mr. W. H. HARVEY,
17, Old Queen Street, Westminster, S.W.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

JAMES MILNE & SON LTD.

ENTIRELY NEW ISSUES.

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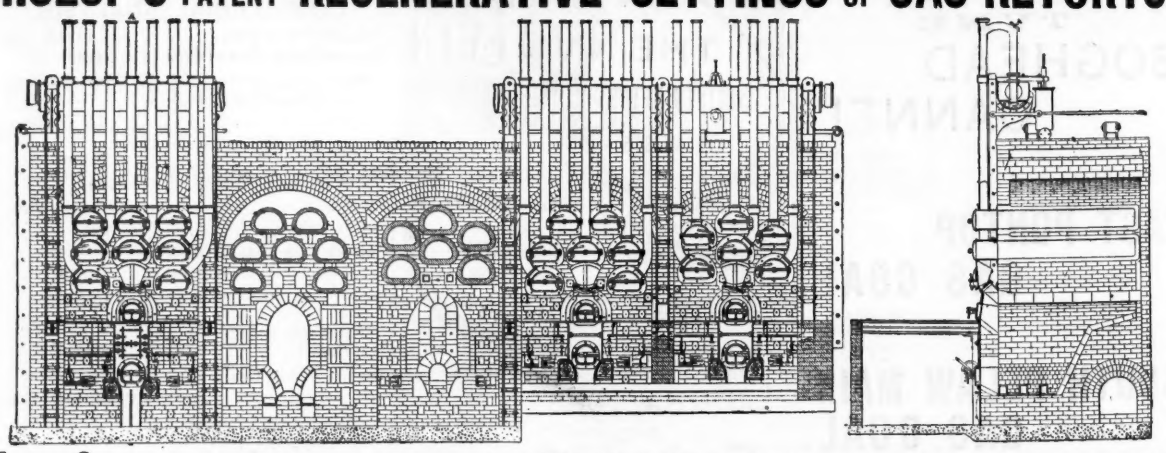

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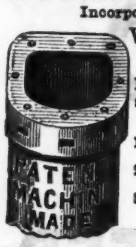

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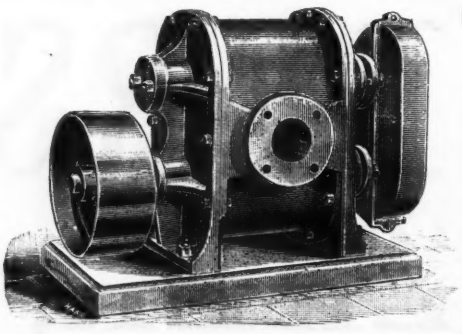

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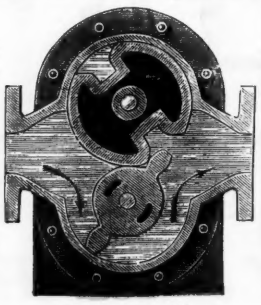

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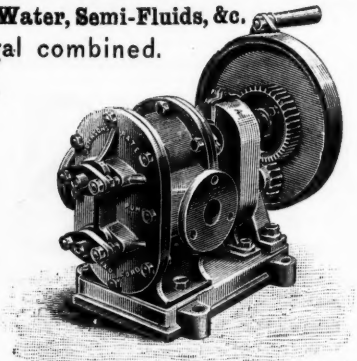

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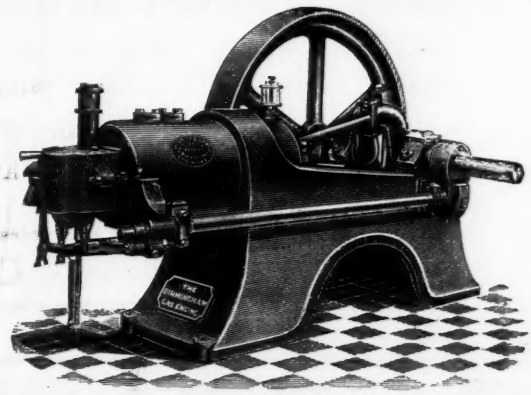

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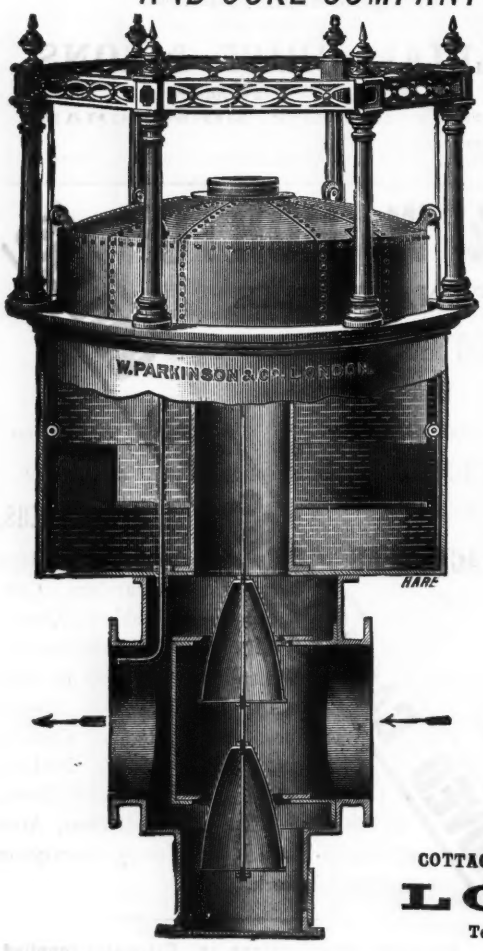

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[See also Advt. p. 430

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